Work Plan
for
Groundwater Investigation at Parcel E-2

Hunters Point Shipyard
San Francisco, California

February 2008

Document Control No. CEKA-3001-0000-0003

Prepared for:

NAVFAC
Naval Facilities Engineering Command
SOUTHWEST DIVISION

Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
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Prepared by:

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Contract No.: N62473-07-C-3001
DO/CTO #: Not applicable. Stand-alone contract

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PROGRAM MANAGEMENT OFFICE WEST
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FEB 1 4 2008

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Dear BCT Members:

Enclosure (1), Work Plan for Groundwater Investigation at Parcel E-2, Hunters Point Shipyard, San Francisco, California, dated February 2008, is provided for your review. Per our discussions at the August and September 2007 BCT meetings, this project is funded with the intention of having an abbreviated, single review period. As such, please provide the Navy comments **no later than Monday, February 25**. The Navy's intention is to "go final" with the work plan the week of 25 February and be in the field collecting data the same week.

Should you have any concerns regarding the enclosed report, please contact Mr. Mark Walden at (619) 532-0931 or myself at (619) 532-0913.

Sincerely,

KEITH FORMAN
BRAC Environmental Coordinator
By direction of the Director

Enclosure: 1. Work Plan for Groundwater Investigation at Parcel E-2, Hunters Point Shipyard, San Francisco, California (February 2008)

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February 5, 2008

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Appendices

Acronyms and Abbreviations

APPL	Agriculture and Priority Pollutants Laboratory, Inc.
ARAR	Applicable or Relevant and Appropriate Requirements
BCT	BRAC Cleanup Team
BMP	Best Management Practice
BRAC	Base Realignment and Closure
CCR	California Code of Regulations
CE2	CE2 Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DPT	direct-push technology
DQO	data quality objective
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
HDPE	high-density polyethylene
HPS	Hunters Point Shipyard
CE2-Kleinfelder JV	CE2-Kleinfelder Joint Venture
Navy	United States Department of the Navy
NEDD	Naval Electronic Data Deliverable
NIRIS	Naval Installation Restoration Information Solution
NNP	non-Navy property
NPL	National Priorities List
PCBs	polychlorinated biphenyls
QC	quality control
RI/FS	Remedial Investigation/Feasibility Study
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RWQCB	California Regional Water Quality Control Board – San Francisco Bay Region
SAP	Sampling and Analysis Plan
SSHP	Site-Specific Safety and Health Plan
TIZ	Tidally-Influenced Zone
TMZ	Tidal Mixing Zone
TPH	Total Petroleum Hydrocarbons
TtEC	Tetra Tech EC
VOC	volatile organic compound
USC	United States Code

1.0 Introduction

CE2-Kleinfelder Joint Venture (CE2-Kleinfelder JV) has prepared this Work Plan to further assess the presence and lateral extent of shallow groundwater contamination within Parcel E-2, Hunters Point Shipyard (HPS), San Francisco, California. This work will be performed for the U.S. Department of the Navy (Navy), Base Realignment and Closure (BRAC) Project Management Office West, in accordance with Contract No. N62473-07-C-3001. The investigation will be conducted and reported by the CE2-Kleinfelder JV. The CE2-Kleinfelder JV will subcontract services for subsurface geophysics, drilling, location surveying, chemical analysis, and data validation.

A Sampling and Analysis Plan (SAP) is included as Appendix A. The Work Plan references figures and tables provided in Appendix A, rather than duplicating these items.

Parcel E-2 is located in a radiation-impacted area. All field work will be coordinated with the HPS radiation safety program developed and administered under a separate contract between the Navy and Tetra Tech EC (TtEC).

1.1 Objectives and Scope of Work

The Navy is currently in the process of preparing a Remedial Investigation/Feasibility Study (RI/FS) for the contiguous area consisting of the closed Industrial Landfill (hereafter identified as the "Parcel E-2 Landfill") and the surrounding areas that contain isolated or non-contiguous pockets of buried solid waste at Parcel E-2. The BRAC Cleanup Team (BCT) consisting of representatives from the Navy, the U.S. Environmental Protection Agency (EPA), the California Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board – San Francisco Bay Region (RWQCB), determined in the August 2007 BCT meeting that additional groundwater analytical data for the above-mentioned constituents was needed to complete the RI/FS.

The purpose of this investigation is to obtain additional information regarding the lateral extent of the following analytes in the A-Aquifer:

- Total petroleum hydrocarbons - purgeables.
- Total petroleum hydrocarbons - extractables.
- Ammonia (as nitrogen).
- Polychlorinated biphenyls (PCBs).
- Dissolved metals.

This groundwater investigation is part of ongoing efforts by the Navy to address contamination at HPS Parcel E-2 in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) by providing data for use in preparing the Parcel E-2 RI/FS. The RI/FS is a mechanism for characterizing the nature and extent of site risks and evaluating potential remedial alternatives.

The specific goals of this study presented below are intended to provide supplemental data for the RI/FS and evaluation of remedial alternatives for Parcel E-2:

1. Provide data to evaluate whether landfill contaminants are present in A-Aquifer groundwater at the shoreline.
2. Provide data to evaluate whether landfill contaminants are present in A-Aquifer groundwater at the upper panhandle.
3. Provide data from the A-Aquifer to evaluate the effectiveness of the PCB Hot Spot area removal action.
4. Provide data to evaluate whether A-Aquifer groundwater beneath the metal slag excavation area of the Parcel E-2 panhandle has been impacted by dissolved metals.

The site investigation will be implemented using the following approach:

1. Collect grab groundwater samples from the A-Aquifer using Direct Push Technology (DPT) to advance boreholes and set 56 temporary wells.
2. Collect grab groundwater samples from seven existing piezometers screened in the A-Aquifer.

The results of the investigation will be presented in a Technical Memorandum.

1.2 Project Schedule

Field sampling is scheduled to begin in February 2008 followed by issuance of a Technical Memorandum. The anticipated schedule for field work and reporting is presented in Worksheet #16 of the SAP.

1.3 Project Organization and Points of Contact

Worksheet #7 in the SAP shows the project roles and contact information for key Navy, CE2-Kleinfelder JV, subcontractors, and regulatory individuals involved with the Parcel E-2 groundwater investigation project. A project organization chart is provided as Worksheet #5 in the SAP.

1.4 Work Plan Organization

This Work Plan is organized as follows:

Section 1.0, Introduction – An overview of the project objectives, project scope of work, project schedule, project organization, project points of contact, and the organization of the Work Plan.

Section 2.0, Site Conditions and Background – A summary of the site background, history, hydrogeology, previous investigations and remedial actions taken to date.

Section 3.0, Regulatory Framework – Decision makers, technical or regulatory standards, and permitting.

Section 4.0, Technical Approach - A description of the planned site investigation activities.

Section 5.0, References – A list of documents cited in this Work Plan.

Appendix A – Sampling and Analysis Plan (SAP)

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2.0 Site Conditions and Background

The location of HPS and parcel divisions within HPS are shown in SAP Figure 1. SAP Figure 2 shows Parcel E-2 and investigation locations where this scope of work will be performed.

2.1.1 Hunters Point Shipyard Parcel E-2 Background

HPS was owned and operated as a commercial dry dock facility until 1939, when the Navy purchased the property from Bethlehem Steel. Upon the entry of the U.S. into World War II in 1941, the Navy immediately began to expand HPS into a naval shipyard. The Navy began excavation of the hills surrounding the shipyard, using the resulting spoils to expand the shoreline into the Bay. Quays, docks, and support buildings were built on an expedited wartime schedule to support the shipyard's mission of fleet repair and maintenance.

Parcel E-2 is part of an area created by the Navy in the 1940s, 1950s, and 1960s by filling in the Bay margin with a variety of material, including soil, crushed bedrock, dredged sediments, and debris. From 1976 to 1986, most of Parcel E-2 was leased to and occupied by Triple A Machine Shop, Inc. a privately held ship repair company, after which the Navy resumed occupancy.

HPS was identified as a National Priorities List (NPL) site by the U.S. Environmental Protection Agency (EPA) in 1989. As a result, the Navy is conducting investigations in accordance with CERCLA (Title 42 *United States Code* [USC] Sections [§§] 9601-9675) at a number of sites at HPS where releases of CERCLA hazardous substance have occurred. As a management tool to accelerate site investigation, cleanup, and reuse, HPS was divided into geographic parcels and Installation Restoration sites within each parcel that are evaluated concurrently.

HPS is currently divided into six parcels; Parcels B, C, D, E, E-2, and F (SAP Figure 1). In 1992, the Navy divided HPS into five contiguous parcels (A, B, C, D, and E) to aid in coordination and tracking of environmental investigation and cleanup. In 1996, the Navy added a sixth parcel (Parcel F), also known as the offshore area that encompasses an area of about 465 acres extending under the San Francisco Bay. In September 2004, the Navy divided Parcel E into two parcels (Parcels E and E-2) to facilitate the closure of the Parcel E-2 Landfill and its adjacent areas. In December 2004, the Navy transferred Parcel A to the San Francisco Redevelopment Agency.

2.1.2 Physical Setting

Parcel E-2 consists of 47.4 acres of shoreline and lowland coast along the southwestern portion of HPS (SAP Figure 1). Parcel E-2 is bounded by:

- Property owned by the University of California, San Francisco and a portion of Parcel E to the north.
- The San Francisco Bay to the south.

- Portions of Parcel E to the east.
- Non-Navy property to the west outside the HPS perimeter.

The maximum ground surface elevation in Parcel E-2 is about 20 feet above mean sea level (msl). The Parcel E-2 Landfill is covered with either several feet of soil or a multilayer interim landfill cap composed of geosynthetic materials with a soil vegetative cover. Surface runoff from Parcel E-2 flows into the Bay.

Seasonal vegetation is present outside of the Landfill Area, and portions of the shoreline are covered with concrete riprap. Saline emergent wetlands (approximately 2.38 acres) are present along the Parcel E-2 shoreline. In addition, a 1.3-acre seasonally ponded area is located in the Panhandle Area of Parcel E-2.

No buildings are present in Parcel E-2. Limited underground utilities are located in the northeastern portion of Parcel E-2.

2.1.3 Site Description

The overall composition of the fill material, on which the Parcel E-2 Landfill was created, is primarily sand and clay with intermixed construction debris. By 1969, filling activities at Parcel E-2 were largely complete with the exception of a channel that extended from near the Bay to the north corner of Parcel E-2 (indicated on Figure 2 as the 1969 historic shoreline). This channel was filled in by 1975, at which time the landfill was closed by placing and compacting a soil cover.

The Navy constructed a 14.5 acre interim landfill cap consisting of a multilayer system of sub-base soil, high-density polyethylene (HDPE) membrane, synthetic drainage layer, and topsoil over the largest contiguous disposal area in response to an August 2000 fire at the landfill.

The remainder of Parcel E-2 has relatively flat topography, and is covered by fill that contains non-contiguous pockets of solid waste. Low-lying seasonal wetlands are located southwest of the landfill. A former experimental ship-shielding area and a metal slag area are located in the Panhandle. The PCB Hot Spot area is located near the southern edge of the landfill. A soil removal action was conducted within the PCB Hot Spot area in 2006.

An approximately 500 feet long sheet-pile wall, installed by the Navy in 1997, extends along the shoreline to the south of the landfill cap.

An intertidal zone, between about 25 – 75 feet wide, extends along the length of the Bay shoreline (referred to as the "Shoreline area" on SAP Figure 2). This zone contains areas covered with concrete riprap, exposed shoreline sediments, and emergent saline wetlands.

2.1.3.1 Site Use

Based on subsequent investigations, Parcel E-2 was primarily used as a landfill for municipal-type waste and construction debris. Solid waste, including wood, paper, plastic, metal, glass, asphalt, concrete, and bricks is mixed with sand, clay, and gravel fill. Historic information indicates that industrial wastes were also disposed of in or around the landfill including sandblast grit, radioluminescent devices, asbestos-containing debris, paint sludge, solvents, and waste oils.

2.1.3.2 Hydrogeology

A conceptual summary of the site hydrogeology is presented in the following sections. More detailed information about the site hydrogeology is available in the *Draft Parcel E-2 Remedial Investigation/Feasibility Study Hunters Point Shipyard San Francisco, California* (Engineering/Remediation Resources Group, Inc and Shaw Environmental, Inc., 2007).

Hydrostratigraphy

Four hydrostratigraphic units have been defined at HPS:

A-Aquifer - The unconfined A-Aquifer extends across all of Parcel E-2 and consists primarily of heterogeneous artificial fill and marine sediments comprised fo fine sand, clay, silt, and silty and clayey sands. In some places the groundwater in shallow fractured bedrock is in hydraulic connection with the A-Aquifer. The A-Aquifer in Parcel E-2 extends from first encountered groundwater a few feet below grade up to between about 10 feet to 20 feet below ground surface.

Bay Mud Aquitard - The A-Aquifer is underlain by a thick, relatively impermeable layer of Bay Mud deposits (mostly clays and silty clays), which range in thickness from about 45 feet at the shoreline to about 10 feet under the central portion of the landfill. The Bay Mud Aquitard extends across most of Parcel E-2 except where it pinches out in the northernmost part of the parcel.

B-Aquifer - The B-Aquifer is not continuous and directly underlies the A-Aquifer where the Bay Mud Aquitard is absent. The B-Aquifer is confined to semi-confined across most of Parcel E-2 where it underlies the Bay Mud Aquitard. In the northern part of the parcel, where it is in direct contact with the A-Aquifer it is likely under semiconfined conditions.

Bedrock Water-Bearing Zone - The Bedrock Water-Bearing Zone consists of isolated pockets of fractured bedrock that are not hydraulically connected to upper hydrostratigraphic units. It lies about 40 feet below ground surface in the northern part of Parcel E-2 and nearly 270 feet below ground surface along the shoreline.

2.1.3.3 Local Hydrologic Setting and Groundwater Flow

Recharge and Discharge

Most groundwater recharge occurs by direct infiltration of precipitation falling on the upland areas of non-Navy property (NNP) and by precipitation falling on unpaved areas onsite, especially in Parcels E and E-2. Most precipitation typically occurs November through April.

Groundwater discharges from the A-Aquifer to the San Francisco Bay along a tidal mixing zone.

A-Aquifer

Across most of Parcel E-2, groundwater elevations in the A-Aquifer generally range from sea level to 7 feet above msl. A-Aquifer groundwater flows in a southerly direction toward the Bay; however, flow in the northeast portion of Parcel E-2 flows in an easterly direction toward a groundwater sink located along the Parcel D and E boundary.

Groundwater elevations in the A-Aquifer are also influenced by tidal fluctuations that create a sinusoidal pressure wave near the shoreline. Tidal influence in the A-Aquifer decreases with increasing distance from the shoreline. Four tides occur daily with tidal periods being approximately six hours. At HPS, the mean tide range (difference in height between mean high water and mean low water) is approximately 5 ft. A Tidally Influenced Zone (TIZ) has been defined for the A-Aquifer where tides cause groundwater elevations to fluctuate by 0.1 ft or more. The width of the TIZ varies from approximately 75 to 500 ft along the HPS shoreline. The Tidal Mixing Zone (TMZ) is defined as the area where A-Aquifer groundwater mixes with water from San Francisco Bay. The TMZ is likely much narrower than the TIZ, but has not been fully delineated. The TIZ is approximately 100 – 250 feet wide at Parcel E-2.

Local anomalies in groundwater elevation in Parcel E-2 can be caused by the interaction of subsurface utilities (sanitary sewer, storm sewer, and water supply lines) with the regional groundwater regime. Backfill material along the subsurface utilities, where submerged below the water table, can serve as preferential pathways for groundwater flow. Depending on location and depth, the backfill materials can either discharge or receive groundwater.

B-Aquifer

Based on the groundwater elevations in the limited number of wells screened in the B-Aquifer within Parcel E-2, groundwater in the uppermost B-Aquifer flows to the southeast. Water elevations in these wells tend to be slightly higher than corresponding A-Aquifer wells.

In Parcel E-2, groundwater elevations in monitoring wells completed in the semi-confined B-Aquifer can be up to about 3 feet higher than in nearby wells completed in the A-Aquifer. Across much of Parcel E-2, the Bay Mud hydraulically separates the A- and B-Aquifers.

2.1.4 Summary of Previous Investigations and Remedial Actions

Prior soil and/or groundwater investigations in Parcel E-2 have detected concentrations of volatile organic compounds (VOCs), PCBs, dissolved metals, petroleum hydrocarbons, and ammonia. Additionally, evidence of low-level radioactivity has been detected.

In 1984, environmental investigations began in the area later designated as Parcel E-2. The investigations included geophysical surveys, excavation of test pits to delineate the extent of landfill waste, a soil gas survey to evaluate the presence of VOCs in soil and groundwater, the drilling of deep soil borings, and the installation of groundwater monitoring wells. Groundwater sampling began in 1989. Starting in 2001, studies have included defining the nature and extent of landfill gas, refining the lateral extent of solid waste, evaluating liquefaction potential, delineating wetlands areas adjacent to the landfill, and collecting soil samples. Landfill compliance monitoring began in 2003 to satisfy regulatory requirements as outlined in 27 CCR. These activities include landfill gas (methane) control and monitoring, groundwater monitoring, landfill-cover integrity monitoring and maintenance, and stormwater management and monitoring. In 2004, the Navy separated the original Parcel E into: (1) Parcel E to the south, and (2) Parcel E-2 to the north.

Past remediation investigations and interim removal actions implemented at Parcel E-2 are described in the *Parcel E-2 Remedial Investigation/Feasibility Study Hunters Point Shipyard San Francisco, California (Draft* - Engineering/Remediation Resources Group, Inc. and Shaw Environmental, Inc., 2007).

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3.0 Regulatory Framework

The following section presents the project regulatory framework.

3.1 Principal Decision Makers

Ongoing base closure work at HPS is overseen by the Navy's Base Realignment and Closure Program Management Office West, in San Diego, California. As the lead agency under Executive Order 12580, the Navy has authority over evaluation of risk, remedy selection alternative, and overall public participation at HPS. The Navy is coordinating with the U.S. EPA, DTSC, and the RWQCB. The Navy, EPA, DTSC, and RWQCB representatives are collectively referred to as the BCT for HPS.

3.2 Technical or Regulatory Standards

This groundwater investigation is being conducted under the auspices of a Federal Facilities Agreement that provides a procedural framework and schedule for the CERCLA cleanup process at HPS. Activities are performed in accordance with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan.

3.3 Permitting Requirements

In accordance with Section 121(e) of CERCLA 1980 [CERCLA, 42 United States Code, Section 9621(e)], as amended, which states that no federal, state, or local permits shall be required for the portion of any removal or remedial action conducted entirely onsite, the work activities to be conducted do not require permits. Although formal permits are not required, substantive compliance with applicable requirements will be met.

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4.0 Technical Approach

The objective of this investigation is to further assess the lateral extent of Total Petroleum Hydrocarbons (purgeable and extractable), ammonia, PCBs, and elevated dissolved metals, in groundwater in the A-Aquifer in select areas within the Parcel E-2 Landfill.

The technical approach, including sampling design and procedures, is presented in detail in Worksheet #17 of the SAP. In summary, the field activities for the project include:

1. Preparatory activities.
2. Installing 56 temporary wells screened in the A-Aquifer.
3. Collecting grab groundwater samples from the temporary wells and from seven existing piezometers.
4. Decommissioning the temporary wells.
5. Disposing of investigation-derived waste.

4.1 Preparatory Activities

Prior to beginning field work, the following preparatory activities will take place:

- The U.S. Navy Remedial Project Manager (RPM), Resident Officer in Charge of Construction (ROICC) and the appropriate HPS security and fire department personnel will be notified regarding the anticipated work.
- All sampling personnel will review the appropriate sections of the Sampling and Analysis Plan (SAP) attached to this Work Plan and sign the project sign-off sheet.
- All affected personnel will read the Accident Prevention Plan and associated Site-Specific Safety and Health Plan and sign an acknowledgement form. They will also attend required HPS Radiation Awareness Training conducted by Tetra Tech EC.
- Underground Service Alert will also be notified in at least two full working days in advance of any excavation/drilling/coring activity. Additionally, the investigation area will be geophysically surveyed to identify potential obstructions or utilities at direct-push locations and sampling locations will be modified as necessary.
- Mobilization activities will include site preparation, movement of equipment and materials to the site, and orientation of field personnel. Upon receipt of appropriate authorizations, site personnel will be mobilized to the site.

4.2 Temporary Well Installation

56 direct-push boreholes will be advanced at locations shown in Figure 2 of the SAP in accordance with the procedures detailed in the SAP. To better determine the depth of the A-Aquifer, continuous core will be collected at six locations in the north-central panhandle.

0.75-inch outer diameter PVC well casing will be installed in the boreholes and the annulus around the well screen will be filled with sand up to two feet above the well screen. The top of the borehole will be temporarily sealed.

The location of the temporary wells will be surveyed.

4.3 Groundwater Sampling

SAP Worksheet #17 describes procedures to be used for collecting grab groundwater sampling from the temporary wells advanced into the A-Aquifer and also from seven existing piezometers. Samples will be collected using a peristaltic pump located at ground surface with well-specific, disposable, Teflon-lined, plastic tubing lowered to within one foot of the bottom of each temporary well or piezometer. Sample collection will commence when sufficient water has entered the well casing. If the well runs dry during the initial sampling attempt, samples will be collected on subsequent days as water recharges into the well.

Analytical methods were selected to provide data of the necessary quality to meet the Data Quality Objectives (DQOs) for this project and to maintain the consistency and comparability of the data with ongoing monitoring at the site.

Grab groundwater samples collected from the temporary wells being installed in the metal slag area will be analyzed for dissolved metals using EPA Method 6010B (with EPA Method 7470A for mercury).

Grab groundwater samples collected from the temporary wells being installed in the PCB Hot Spot area will be analyzed for PCBs using EPA Method 8082 and Total Petroleum Hydrocarbons (TPH) (purgeable and extractable) using EPA Method 8015B.

Grab groundwater samples collected from the temporary wells being installed along the Parcel E-2 shoreline and in the upper panhandle area will be analyzed for Total Petroleum Hydrocarbons (purgeable and extractable) using EPA Method 8015B, ammonia as nitrogen using EPA Method 350.1, PCBs using EPA Method 8082, and dissolved metals using EPA Method 6010B (with EPA Method 7470A for mercury).

Samples are to be collected in the following order as applicable at each location:

1. TPH –purgeable.
2. TPH - extractable.
3. Ammonia as nitrogen.
4. PCBs.
5. Dissolved metals.

Samples for dissolved metals analysis will be collected in containers without preservative and the analytical laboratory will be instructed to perform sample filtering using a 0.45 micron filter prior to performing analyses.

Samples will be properly labeled, stored, and transported to the analytical laboratory under chain-of-custody in accordance with the SAP.

Agriculture and Priority Pollutants Laboratory, Inc. (APPL) is the selected analytical laboratory for this project. APPL is located in Fresno, California and will perform the groundwater analyses as specified in the SAP.

APPL meets the requirements of the National Environmental Laboratory Accreditation Program, the State of California Environmental Laboratory Accreditation Program, the Naval Facilities Engineering Service Center, and the latest version of the Department of Defense Quality Systems Manual.

The primary functions of a sampling and analysis program are to obtain accurate, representative environmental samples and to provide defensive analytical data. A program for evaluating field and laboratory data is developed to achieve these goals. The quality of field data will be assessed through regular collection and analysis of field quality control (QC) samples. Laboratory QC samples will also be analyzed in accordance with referenced analytical method protocols to ensure that laboratory procedures are conducted properly and that the quality of the data is known. The SAP describes the types of QC samples to be collected and analyzed for this project and their role in ensuring that the project data are acceptable.

4.4 Temporary Well Decommissioning

SAP Worksheet #17 details the procedure for decommissioning the temporary wells. The PVC temporary wells will be removed and the boreholes backfilled with grout.

4.5 Investigation-Derived Waste

Groundwater, personal protective equipment and associated waste generated during this project will be stored in Department of Transportation approved 55-gallon drums and soil will be stored onsite in core boxes to be screened for radiation and disposed of in accordance with HPS site protocols. SAP Worksheet #17 provides details of waste disposal requirements and procedures.

4.6 Location Surveying

Each temporary well location will be surveyed by a professional land surveyor, licensed by the State of California. The surveyor will provide the elevation at backfilled ground surface for each temporary well location to a precision of 0.01 ft and its location to a precision of plus or minus 0.1 ft horizontally, based on the borehole center. The elevations will be surveyed relative to the 1929 National Geodetic Vertical Datum. The boring locations will be surveyed using the 1927 North American Datum State Plane Coordinate System, California, Zone 3. Vertical coordinates will be reported as feet relative to mean sea level.

The seven piezometers will also be surveyed according to the above procedures but will also include elevation surveying of the top-of casing in addition to ground elevation.

4.7 Safety and Health

Field activities for this project will be performed in accordance with the *Accident Prevention Plan for Parcel E-2 Groundwater Investigation* and associated Site-Specific Safety and Health Plan (CE2-Kleinfelder, 2008). Radiation training and monitoring of personnel, tools, material, equipment, and IDW will be conducted by Tetra Tech EC in accordance with a project-specific work instruction. This will include directing requirements for site access/egress and tools, materials, equipment, storage and associated decontamination.

5.0 Reporting

The results of the site characterization will be reported in a Technical Memorandum reviewed and signed by a California-licensed Professional Geologist. The Technical Memorandum will include:

- Descriptions of field activities and methodologies used.
- Analytical data and associated validation reports.

Analytical result and hydrogeologic observations made during this investigation will be used by another Navy contractor as appropriate to develop groundwater remediation alternatives presented in the Parcel E-2 RI/FS.

Electronic data will be uploaded in Naval Electronic Data Deliverable (NEDD) format into the Naval Installation Restoration Information Solution (NIRIS).

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6.0 References

CE2-Kleinfelder JV, 2008. "Accident and Prevention Plan for Groundwater Investigation at Parcel E-2 – Hunters Point Shipyard, San Francisco, California." January.

Engineering/Remediation Resources Group, Inc. – Shaw Environmental, Inc., 2007. "Draft Parcel E-2 Remedial Investigation/Feasibility Study – Hunters Point Shipyard, San Francisco, California, March.

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Appendix A

Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for Groundwater Investigation at Parcel E-2

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SAP Worksheet #1 – Title and Approval Page

Final Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for Groundwater Investigation at Parcel E-2

Hunters Point Shipyard
San Francisco, California

February 2008

Document Control No. CEKA-3001-0000-0003

Prepared for:

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DO/CTO #: Not applicable. Stand-alone contract.

Review Signature: _____ February 4, 2008
Mohammad Abri — Date
Corporate Quality Assurance Manager
CE2 Corporation

Approval Signature: _____ 2/5/2008
Narciso Ancog — Date
Quality Assurance Officer
NAVFAC Southwest

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Figures

Executive Summary

This document presents the Sampling and Analysis Plan (SAP) for a groundwater investigation at Parcel E-2 for the Hunters Point Naval Shipyard (HPS) located in San Francisco, California (Figure 1).

This SAP is appended to the Work Plan for Groundwater Investigation at Parcel E-2 (CE2-Kleinfelder, 2007) and is referenced therein. Included in this SAP are information regarding project organization and planning, data quality objectives, project tasks, quality assurance/quality control (QA/QC) and related analytical requirements, and data verification and validation. The contents of this SAP incorporate the required elements of a Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP). This SAP is compliant with the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) (March 2005) and the Environmental Protection Agency Requirements for Quality Assurance Project Plans (EPA QA/R-5) (March 2001). This SAP has been prepared in accordance with NAVFAC Southwest revisions to the UFP QAPP requirements and as such is comprised of 37 Worksheets (WSs).

SAP Objective

This SAP supports the Work Plan for Groundwater Investigation at Parcel E-2. The Navy is currently in the process of preparing a Remedial Investigation/Feasibility Study (RI/FS) for Parcel E-2. Parcel E-2 is a contiguous area consisting of the closed Industrial Landfill (hereafter identified as the "Parcel E-2 Landfill") and the surrounding areas that contain isolated or non-contiguous pockets of buried solid waste. The investigation detailed in this SAP is designed to provide additional data to support the development of remedial alternatives by another Navy contractor to address groundwater contamination in the A-Aquifer.

Targeted contaminants being assessed are polychlorinated biphenyls (PCBs), total petroleum hydrocarbon (TPH) both purgeable and extractable, dissolved metals, and ammonia. These substances have been identified as having impacted groundwater at Parcel E-2.

Site Description

HPS was owned and operated as a commercial dry dock facility until 1939, when the Navy purchased the property from Bethlehem Steel. Upon the entry of the U.S. into World War II in 1941, the Navy immediately began to expand HPS into a naval shipyard. The Navy began excavation of the hills surrounding the shipyard, using the resulting spoils to expand the shoreline into the Bay. Quays, docks, and support buildings were built on an expedited wartime schedule to support the shipyard's mission of fleet repair and maintenance.

Parcel E-2 consists of 47.4 acres of shoreline and lowland coast along the southwestern portion of HPS (Figure 1). It is part of an area created by the Navy in the 1940s, 1950s, and 1960s by filling in the Bay margin with a variety of material, including soil, crushed bedrock, dredged sediments, and debris. From 1976 to 1986, most of the area designated as Parcel E-2 in 2004 was leased to and occupied by Triple A Machine Shop, Inc. a privately held ship repair company, after which the Navy resumed occupancy.

HPS was identified as a National Priorities List (NPL) site by the U.S. Environmental Protection Agency (EPA) in 1989. As a result, the U.S. Department of the Navy (Navy) is conducting investigations in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Title 42 *United States Code* [USC] Sections [§§] 9601-9675) at a number of sites at HPS where releases of CERCLA hazardous substance have occurred. As a management tool to accelerate site investigation, cleanup, and reuse, HPS was divided into geographic parcels and Installation Restoration (IR) sites within each parcel that are evaluated concurrently.

Organization of the SAP

This SAP is organized according to the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP). The UFP-QAPP is the product of the Intergovernmental Data Quality Task Force (IDQTF). It is the companion to the Uniform Federal Policy for Implementing Environmental Quality Systems (UFP-QS). The UFP-QS was developed to consistently implement the quality system requirements of ANSI/ASQ EA, Quality Systems for Environmental Data and Technology Programs.

The 37 Worksheets include information about:

- Project Organization and Planning.
- Data Quality Objectives (DQOs).
- Project Tasks.
- Quality Assurance/Quality Control (QA/QC) and Related Analytical Requirements.
- Data Verification and Validation and Usability Assessment.

Technical Memorandum

The results of the site characterization will be reported in a Technical Memorandum reviewed and signed by a California-licensed Professional Geologist. The Technical Memorandum will include:

- Descriptions of field activities and methodologies used including results of field quality assurance auditing.
- Analytical data, quality control summary report, and data validation reports.

Analytical result and hydrogeologic observations made during this investigation will be used by another Navy contractor as appropriate to develop groundwater remediation alternatives presented in the Parcel E-2 RI/FS.

Electronic data will be uploaded in Naval Electronic Data Deliverable (NEDD) format into the Naval Installation Restoration Information Solution (NIRIS).

Acronyms and Abbreviations

%R	Percent Recovery
AA	Atomic Absorption
APP	Accident Prevention Plan
APPL	Agriculture and Priority Pollutants Laboratories, Inc.
BEC	Base Environmental Coordinator
BGS	below ground surface
BRAC	Base Realignment And Closure
CAS	Chemical Abstract System
CCV	Continuing Calibration Verification
CE2-Kleinfelder JV	CE2-Kleinfelder Joint Venture
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHG	Certified Hydrogeologist
CIH	Certified Industrial Hygienist
CLP	Contract Laboratory Program
COC	Chain-of-Custody
DOT	U.S. Department of Transportation
DPT	direct-push technology
DQI	data quality indicator
DQO	data quality objective
DTSC	California Department of Toxic Substances Control
ECD	electron capture device
FID	flame ionization detector
FS	Feasibility Study
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
HDPE	high-density polyethylene
HGAL	Hunters Point Groundwater Ambient Level
HPS	Hunters Point Shipyard
H&S	health and safety
ICP	inductively coupled plasma
ICV	initial calibration verification
IDW	investigation-derived waste
IR	Installation Restoration (Program)
LCS	laboratory control sample
LDC	Laboratory Data Consultants, Inc.
LIMS	laboratory information management system
MB	method blank
MCL	maximum contaminant level
MDL	method detection limit
MS/MSD	matrix spike/matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program

Acronyms and Abbreviations
(continued)

NFESC	Naval Facilities Engineering Service Center
NIRIS	Naval Installation Restoration Information Solution
NPL	National Priorities List
PAL	project action limit
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCBS	polychlorinated biphenyls
PG	California Professional Geologist
PPE	personal protective equipment
PQOs	project quality objectives
PRQL	project-required quantitation limit
PT	proficiency testing
PVC	polyvinyl chloride
QA	quality assurance
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROICC	Resident Officer in Charge of Construction
RPD	relative percent difference
RPM	Remedial Project Manager
RSD	relative standard deviation
RWQCB	California Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SOP	standard operating procedure
SSHP	Site-Specific Safety and Health Plan
TBD	to be determined
TPH	total petroleum hydrocarbons
TSA	technical systems audit
UFP	Uniform Federal Policy
USCS	Unified Soils Classification System
U.S. EPA	United States Environmental Protection Agency
VOA	volatile organic analysis
VOC	volatile organic compound
WS	Worksheet

SAP Worksheet #2 -- SAP Identifying Information

Site Name/Number: Hunters Point Shipyard (HPS)
Operable Unit: Parcel E-2
Contractor Name: CE2-Kleinfelder Joint Venture (CE2-Kleinfelder JV)
Contract Number: N62473-07-C-3001
Contract Title: Parcel E-2 In-situ Groundwater Sampling, Hunters Point Shipyard – San Francisco, CA (a stand-alone contract)
Work Assignment Number (optional): Not assigned

1. This SAP was prepared in accordance with the requirements of the *Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP)* (United States Environmental Protection Agency, U.S. EPA 2005) and *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS* (U.S. EPA 2002).

2. Identify regulatory program:

   Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

3. This SAP is a project-specific SAP.

4. List dates of scoping sessions that were held:

   No formal scoping sessions were held for this project.

5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.

Title	Date
Final Sampling and Analysis Plan *(Field Sampling Plan and Quality Assurance Project Plan)* *Basewide Groundwater Monitoring Program* *Hunters Point Shipyard, San Francisco, California*	August 20, 2004

6. Organizational partners (stakeholders) and connection with lead organization:

   The stakeholders include the public, U.S. EPA, California Department of Toxic Substances Control (DTSC), California Regional Water Quality Control Board (RWQCB) and the City of San Francisco. The regulatory agencies, the City of San Francisco, and the public oversee the cleanup process, which is being conducted by the U.S. Navy (Navy).

7. Lead organization:

   The lead organization for the project is the Navy. The Navy will use the data gathered through this groundwater investigation to make decisions in conjunction with the stakeholders.

8. If any required SAP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion below.

   No special personnel training requirements apply to this scope of work (Worksheet #8).

   No formal scoping sessions were conducted (Worksheet #9).

   No secondary data was used in developing this SAP (Worksheet #13).

Table 1. UFP-QAPP crosswalk.

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
A. Project Management		
Documentation		
1	Title and Approval Page	
2	Table of Contents SAP Identifying Information	
3	Distribution List	
4	Project Personnel Sign-Off Sheet	
Project Organization		
5	Project Organizational Chart	
6	Communication Pathways	
7	Personnel Responsibilities and Qualifications Table	
8	Special Personnel Training Requirements Table	Not applicable. No special training required for this scope of work.
Project Planning/ Problem Definition		
9	Project Planning Session Documentation (including Data Needs tables) Project Scoping Session Participants Sheet	Not applicable. No formal scoping sessions were conducted.
10	Problem Definition, Site History, and Background. Site Maps (historical and present)	
11	Site-Specific Project Quality Objectives	
12	Measurement Performance Criteria Table	
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	Not applicable. No secondary data used in developing this SAP.
14	Summary of Project Tasks	
15	Reference Limits and Evaluation Table	
16	Project Schedule/Timeline Table	
B. Measurement Data Acquisition		
Sampling Tasks		
17	Sampling Design and Rationale	
18	Sampling Locations and Methods/ SOP Requirements Table Sample Location Map(s)	
19	Analytical Methods/SOP Requirements Table	
20	Field Quality Control Sample Summary Table	
21	Project Sampling SOP References Table Sampling SOPs	
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
Analytical Tasks		
23	Analytical SOPs Analytical SOP References Table	
24	Analytical Instrument Calibration Table	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	
Sample Collection		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody (COC) Form and Seal	
Quality Control Samples		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	
Data Management Tasks		
29	Project Documents and Records Table	
30	Analytical Services Table Analytical and Data Management SOPs	
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	
32	Assessment Findings and Corrective Action Responses Table	
33	QA Management Reports Table	
D. Data Review		
34	Verification (Step I) Process Table	
35	Validation (Steps IIa and IIb) Process Table	
36	Validation (Steps IIa and IIb) Summary Table	
37	Usability Assessment	

SAP Worksheet #3 -- Distribution List

Name of SAP Recipients	Title/Role	Organization	Telephone Number	E-mail Address or Mailing Address	Document Control Number (Optional)
Mark Walden	Remedial Project Manager	U.S. Navy Naval Facilities Engineering Command, Southwest (Navy)	619-532-0931	mark.walden@navy.mil	
Narciso Ancog	Quality Assurance Officer (QAO)	Navy	619-532-3046	narciso.ancog@navy.mil	
Mark Ripperda	Project Manager	U.S. Environmental Protection Agency (EPA)	415-972-3028	Ripperda.mark@epa.gov	
Tom Lanphar	Project Manager	California Department of Toxic Substances Control (DTSC)	510-540-3776	tlanphar@dtsc.ca.gov	
Erich Simon	Project Manager	California Regional Water Quality Control Board (RWQCB)	510-622-2235	ersimon@waterboards.ca.gov	
Edward Kilduff	Program Manager	CE2-Kleinfelder JV	925-463-7301	kilduff@ce2corp.com	
Robert Ferry	Project Manager	CE2-Kleinfelder JV	925-463-7301	rferry@ce2corp.com	
Mohammad Abri	Corporate Quality Assurance Manager (QAM)	CE2-Kleinfelder JV	925-373-9606	mabri@ce2corp.com	
Gary Goodemote	Project QAO	CE2-Kleinfelder JV	510-628-9000	ggoodemote@kleinfelder.com	
Stacie Wissler	Program Chemist	CE2-Kleinfelder JV	858-320-2263	swissler@kleinfelder.com	
Tom Sayre	Field Manager, H&S Officer	CE2-Kleinfelder JV	510-628-9000	tsayre@kleinfelder.com	
Diane Anderson	Analytical laboratory Project Manager	APPL	559-275-2175	danderson@applinc.com	
Richard Amano	Data validation Project Manager	LDC	760-634-0437	ramano@lab-data.com	

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SAP Worksheet #4 -- Project Personnel Sign-Off Sheet

Name	Organization/Title/Role	Telephone Number (optional)	Signature/email receipt	SAP Section Reviewed	Date SAP Read
Mark Walden	Navy / RPM	619-532-0931			
Edward Kilduff	CE2-Kleinfelder JV / Program Manager	925-463-7301			
Robert Ferry	CE2-Kleinfelder JV / Project Manager	925-463-7301			
Gary Goodemote	CE2-Kleinfelder JV / Project QAO	510-628-9000			
Patricia Walters	CE2-Kleinfelder JV / Project Chemist	510-628-9000			
Diane Anderson	APPL	559-275-2175			
Richard Amano	LDC	760-634-0437			
Tom Sayre	CE2-Kleinfelder JV / Field Manager, On-Site H&S Officer	510-628-9000			
TBD	CE2-Kleinfelder JV / Sampling personnel	Not applicable			

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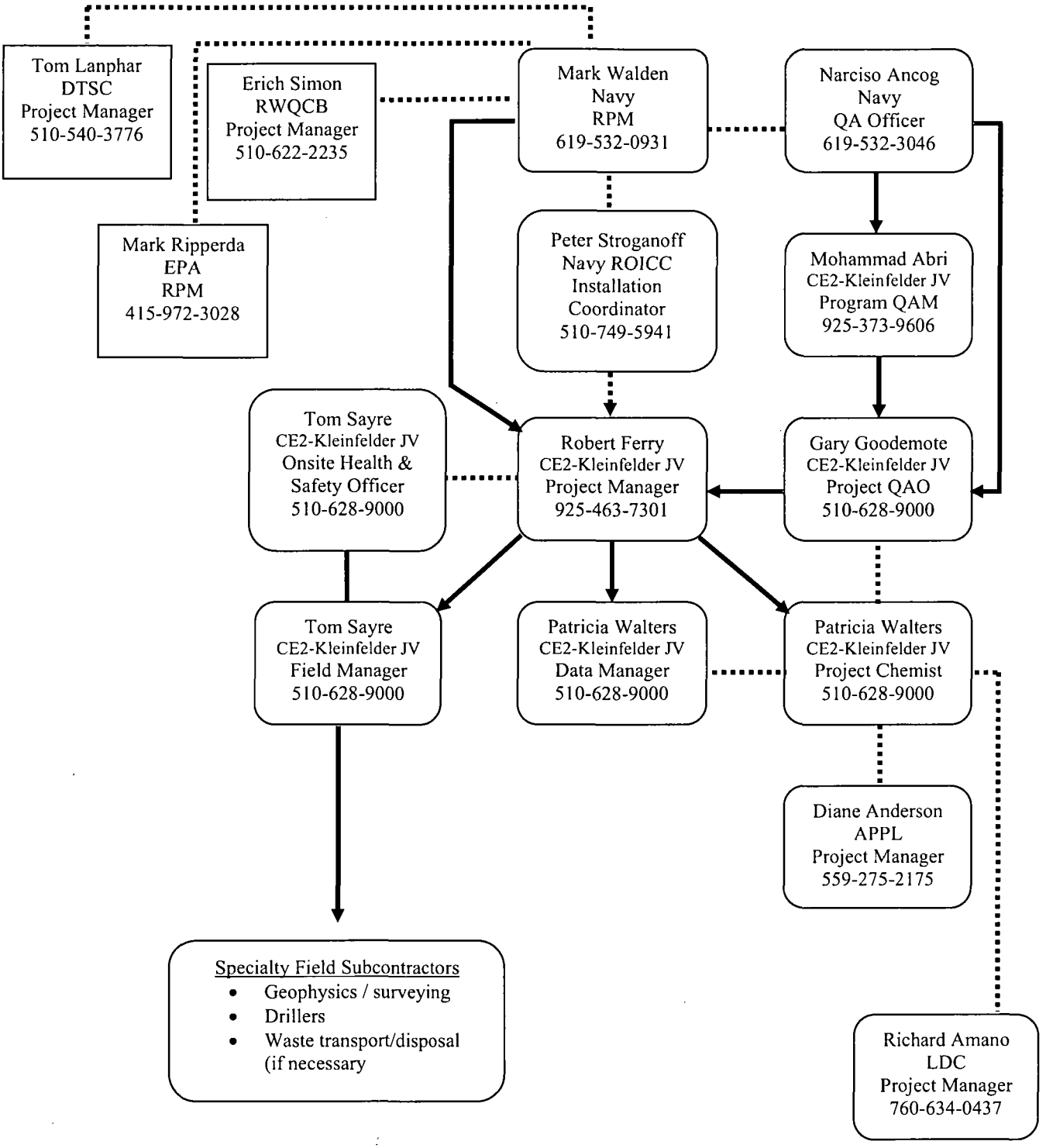
SAP Worksheet #5 -- Project Organizational Chart

Lines of Authority ——— Lines of Communication ·····



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SAP Worksheet #6 -- Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure (timing, pathway to & from, etc.)
Authorization for CE2-Kleinfelder JV to initiate field work	Remedial Project Manager (RPM) U.S. Navy Naval Facilities Engineering Command, Southwest (Navy)	Mark Walden	619-532-0931	CE2-Kleinfelder JV Program Manager communicates either verbally or by e-mail of earliest schedule possible for field work to commence. Navy RPM contacts CE2-Kleinfelder JV Program manager either verbally or by e-mail with instruction to proceed upon completing coordination with Navy radiation safety contractor.
US EPA point of contact with Navy RPM	US EPA	Mark Ripperda	415-972-3028	Reports and other project-related information will be submitted by the Navy Base Environmental Coordinator, (BEC) for review and comments by the agency.
DTSC point of contact with Navy RPM	DTSC	Tom Lanphar	510-540-3776	Reports and other project-related information will be submitted by the Navy BEC for review and comments by the agency.
RWQCB point of contact with Navy RPM	RWQCB	Erich Simon	510-622-2235	Reports and other project-related information will be submitted by the Navy BEC for review and comments by the agency.
Point of contact from the CE2-Kleinfelder JV with Navy RPM	Program Manager (CE2-Kleinfelder JV)	Edward Kilduff	925-463-7301	All materials and information about the project will be forwarded to the Navy RPM by the Program Manager.
Point of contact from the CE2-Kleinfelder JV with Navy QAO	Corporate QAM (CE2-Kleinfelder JV)	Mohammad Abri	925-373-9606	Quality-related materials and information about the project will be forwarded to the QAO by the Corporate QAM.
SAP amendments	Corporate QAM (CE2-Kleinfelder JV)	Mohammad Abri	925-373-9606	Any changes to the SAP are submitted in writing to the Navy QAO, who must approve the changes prior to implementation.

Communication Drivers	**Responsible Affiliation**	**Name**	**Phone Number and/or e-mail**	**Procedure** (timing, pathway to & from, etc.)
SAP amendment approvals	Navy QAO	Nars Ancog	619-532-3046	Issues final approval of SAP amendments to Corporate QAM in form of signed approval form (pdf is acceptable). Review time frame is typically 10 business days, but approval time frame is dependent on degree of edits being made.
Revising monitoring program (adding or removing wells from sampling, revising analytical suite or frequency).	Project Manager (CE2-Kleinfelder JV)	Robert Ferry	925-463-7301	Project Manager determines need revisions. Notifies Field Manager by phone and email of changes at least 2 days prior to field implementation.
Field or analytical corrective actions	Corporate QAM (CE2-Kleinfelder JV)	Mohammad Abri	925-373-9606	The need for corrective actions will be determined by the Corporate QAM, who will notify Project QAO by phone or email, within 2 business days. Project QAO notifies Project Manager and Field Manager (field issues) or Project Chemist (analytical issues) by phone or email within 2 business days.
Field implementation of SAP or SOP changes	Project Manager (CE2-Kleinfelder JV)	Robert Ferry	925-463-7301	Project Manager notifies Field Manager by phone and email of changes at least 2 days prior to field implementation.
Release of groundwater sampling field data for use in Technical Memorandum	Field Manager (CE2-Kleinfelder JV)	Tom Sayre	510-628-9000	Groundwater sampling field data are reviewed by the Field Manager, and are transmitted by email or hard-copy shipping to the Project Manager.
Field deviations from the SAP	Field Manager (CE2-Kleinfelder JV)	Tom Sayre	510-628-900	Field Manager notifies Project Manager by phone or email within 2 days of the SAP deviation (nature of deviation and technical justification).

Communication Drivers	**Responsible Affiliation**	**Name**	**Phone Number and/or e-mail**	**Procedure** (timing, pathway to & from, etc.)
Analytical deviations from the SAP, or reporting lab data quality issues.	Analytical laboratory APPL (subcontractor)	Diane Anderson	559-275-2175	Laboratory notifies Project Chemist by phone or email, and documents SAP deviations in the validated data report.
Data validation issues	Data validator LDC (subcontractor)	Richard Amano	760-634-0437	Data validation firm notifies Project Chemist within 2 business days and documents issues in the data validation report.
Release of analytical data	Data Manager (CE2-Kleinfelder JV)	Patricia Walters	510-628-9000	No analytical data can be released until data are validated and approved by Project Chemist.
Report submittal to regulatory agencies	RPM Navy	Mark Walden	619-532-0931	Navy RPM receives report(s) from CE2-Kleinfelder JV and submits them to EPA, DTSC, and RWQCB through Navy BEC. Navy RPM also provides copies as appropriate to other Navy contractors for use in developing Parcel E-2 remedial alternatives.
Response to regulatory comments	RPM Navy	Mark Walden	619-532-0931	Navy RPM receives regulatory comments on submitted documents via the Navy BEC and coordinates responses with CE2-Kleinfelder JV as necessary.

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SAP Worksheet #7 -- Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities	Education and/or Experience Qualifications (Optional)
Mark Walden	RPM	Navy	• Oversees project and is liaison to regulatory agencies.	
Peter Strogonoff	Navy Resident Officer In Charge Of Construction (ROICC)	Navy	• Oversees protocols for disposition of Investigation-Derived Waste (IDW)	
Narciso Ancog	Navy QAO	Navy	• Provides governmental oversight of the project Quality Assurance (QA) Program. • Provides quality-related directives through Contracting Officer Representative. • Acts as point of contact for all matters concerning QA and the Navy's Laboratory QA Program. • Prepares governmental budget estimates for all QA functions included in contracts. • Coordinates training on matters pertaining to generation and maintenance of quality of data. • Authorizes the suspension of project execution if QA requirements are not adequately followed.	
Steven Coffee	Program Safety and Health Manager	CE2-Kleinfelder JV	• Oversees preparation of company safety programs and compliance • Reviews Accident Prevention Plan (APP) and Site-specific Safety and Health Plan (SSHP) • Acts a liaison between Project Manager and project-specific safety personnel.	CIH

Name	Title/Role	Organizational Affiliation	Responsibilities	Education and/or Experience Qualifications (Optional)
Edward Kilduff	Program Manager	CE2-Kleinfelder JV	• Issues and authorizes Appointment Letters describing duties/responsibilities and delegating authority. • Issues stop-work order when necessary. • Monitors and controls through audits and surveillance of project activities. • Interfaces directly with the Navy to maintain awareness in planning and scheduling.	
Robert Ferry	Project Manager	CE2-Kleinfelder JV	• Issues stop-work order when necessary. • Establishes an overall records management system. • Implements the approved project-specific plans. • Evaluates project-specific procedures and plans. • Evaluates the project schedule and budget.	
Mohammad Abri	Corporate QAM	CE2-Kleinfelder JV	• Serves as a point of contact for the Navy QAO. • Reviews and approves QA/QC plans and revisions. • Assigns, directs, and supports the QA/QC staff. • Trains, qualifies, and evaluates the personnel according to the QA/QC plans. • Reviews project-specific SAPs as required. • Directs QA audits.	
Tom Sayre	Onsite Health & Safety Officer	CE2-Kleinfelder JV	• Implements SSHP. Ensures all onsite personnel have required training and attend daily safety meetings. • Is lead for identifying, communicating, and, as appropriate, addressing corrective actions for encountered hazards not initially addressed in the Site-specific Safety and Health Plan.	
Robert Ferry	Geologist Technical Lead	CE2-Kleinfelder JV	Reviews boring logs and field data as project progresses to ensure sampling locations and depths meet the SAP objectives.	California Professional Geologist (PG) and Certified Hydrogeologist (CHG)

Name	Title/Role	Organizational Affiliation	Responsibilities	Education and/or Experience Qualifications (Optional)
Gary Goodemote	Project QAO	CE2-Kleinfelder JV	• Liaison between Program QAM and Field Manager, ensures proper implementation of field-related SAP requirements. • Performs Technical Systems Audit of field activities. • Implements chemical data QC procedures. • Determines whether project specifications have been met. • Supports report preparation.	
Patricia Walters	Project Chemist	CE2-Kleinfelder JV	• Audits field and laboratory performance as required. • Participates in development of project-specific SAP. • Evaluates and selects qualified subcontract analytical laboratories and data validation companies. • Implements contract requirements for chemical data collection. • Implements chemical data QC procedures. • Reviews laboratory data prior to use. • Coordinates data validation of laboratory data. • Reviews data validation reports. • Supports report preparation and determines whether project specifications have been met..	
Patricia Walters	Data Manager	CE2-Kleinfelder JV	• Imports chemical, sample, and field data into a database system. • Provides chemical, sample, and field data for report production • Transmits validated chemical data to the Navy via the Naval Installation Restoration Information Solution (NIRIS)	
Diane Anderson	Laboratory Project Manager	APPL	• Oversees chemical laboratory analyses and data reporting.	
Richard Amano	Laboratory Project Manager	LDC	• Oversees validation of chemical data and preparation of data validation reports.	

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SAP Worksheet #8 -- Special Personnel Training Requirements Table

Not applicable. No special personnel training is required for this project.

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel / Groups Receiving Training	Personnel Titles / Organizational Affiliation	Location of Training Records / Certificates

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SAP Worksheet #9 -- Project Scoping Session Participants Sheet

Not applicable. No formal scoping sessions were conducted. Scope developed to support groundwater remedial alternative development in the Parcel E-2 RI/FS.

Project Name: Projected Date(s) of Sampling:	Site Name:
Project Manager:	Site Location:
Date of Session:	
Scoping Session Purpose:	

Name	Title	Affiliation	Phone #	E-mail Address	Project Role

Comments/Decisions:

Action Items:

Consensus Decisions:

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SAP Worksheet #10 -- Problem Definition

This worksheet presents a summary site description and presents Step 1 of the EPA's DQO process. A more thorough description of Parcel E-2 conceptual site model elements is presented in Section 2 of the *Work Plan for Groundwater Investigation at Parcel E-2*. Steps 2 through 7 are presented in WS #11.

Site Description

Parcel E-2 encompasses approximately 47.4 acres at HPS (see Figures 1 and 2). The overall composition of the fill material, on which the Parcel E-2 Landfill was created, is primarily sand and clay with intermixed construction debris. By 1969, filling activities at Parcel E-2 were largely complete with the exception of a channel that extended from near the San Francisco Bay to the north corner of Parcel E-2 (indicated on Figure 2 as the 1969 historic shoreline). This channel was filled in by 1975, at which time the Parcel E-2 Landfill was closed by placing and compacting a soil cover.

Due to an August 2000 fire at the Parcel E-2 Landfill, the Navy constructed a 14.5 acre interim landfill cap consisting of a multilayer system of sub-base soil, high-density polyethylene (HDPE) membrane, synthetic drainage layer, and topsoil over the largest contiguous disposal area.

The remainder of Parcel E-2 has relatively flat topography, and is covered by fill that contains non-contiguous pockets of solid waste. Low-lying seasonal wetlands are located southwest of the Parcel E-2 Landfill. A former experimental ship-shielding area and a metal slag area are also located in the Panhandle area of Parcel E-2. The PCB Hot Spot is located near the southern edge of the Parcel E-2 Landfill. A soil removal action was conducted at the PCB Hot Spot in 2006.

An approximately 500 foot (ft) long sheet pile wall was installed by the Navy in 1997, which extends along the shoreline to the southeast of the Parcel E-2 Landfill cap.

An approximately 25 to 75 ft wide intertidal zone extends along the length of the San Francisco Bay shoreline. This zone contains areas covered with concrete riprap,exposed shoreline sediments, and emergent saline wetlands.

Site Use

Parcel E-2 was primarily used as a landfill for municipal-type waste and construction debris. Solid waste includes wood, paper, plastic, metal, glass, asphalt, concrete, rubber tires, engine parts, paint cans, paint sludge and bricks, and is mixed with sand, clay, and gravel fill. Historic information indicates that industrial wastes were also disposed in or around the Parcel E-2 Landfill including sandblast grit, radioluminescent devices, asbestos-containing debris, paint sludge, solvents, and waste oils.

Historical soil and/or groundwater investigations in Parcel E-2 have detected elevated concentrations of volatile organic compounds (VOCs), PCBs, dissolved metals, petroleum hydrocarbons, and ammonia. Additionally, evidence of low-level radioactivity has been detected in Parcel E-2.

DQO Step 1. State the problem:

A Remedial Investigation/Feasibility Study (RI/FS) is currently being prepared by the Navy for Parcel E-2 that will include an evaluation of remedial alternatives for addressing groundwater contamination.

The Base Realignment and Closure (BRAC) Cleanup Team has determined that the lateral extent of select contaminants in the Parcel E-2 A-Aquifer groundwater requires further investigation in order to provide additional data for development of appropriate remedial alternatives, specifically:

- Polychlorinated biphenyls (PCBs) and petroleum hydrocarbons in the PCB Hot Spot area located in the southeastern corner of Parcel E-2 (Figure 2).
- Dissolved metals in the metal slag area located in the southwestern end of the Parcel E-2 panhandle (Figure 2).
- PCBs, petroleum hydrocarbons, dissolved metals, and ammonia immediately south of the landfill area and throughout the northern portion of the panhandle (Figure 2).

SAP Worksheet #11 -- Project Quality Objectives/Systematic Planning Process Statements

The Navy and its contractors will use the data generated from this project to complete the Parcel E-2 RI/FS that will subsequently be used by the regulatory agencies for selecting a remedial alternative.

Steps 2 through 7 of EPA's 7-step Data Quality Objective (DQO) process are presented below, followed by a list of the Project Quality Objectives.

DQO Step 2. Identify the Goal of the Study:

The goals of this study are presented below. All of these goals are intended to provide supplemental data for the RI/FS and evaluation of remedial alternatives for Parcel E-2.

1. Provide data to evaluate whether landfill contaminants are present in A-Aquifer groundwater at the shoreline.

   If PCBs, TPH, or ammonia are detected above the method detection limit (MDL), the data will be interpreted as the landfill contaminants are present in the A-Aquifer at the shoreline. If dissolved metals are detected, this will indicate that the groundwater may have been impacted and the data will be used in the RI/FS and the RD process by another Navy contractor.

2. Provide data to evaluate whether landfill contaminants are present in A-Aquifer groundwater at the upper panhandle.

   If PCBs, TPH, or ammonia are detected above the MDL, the data will be interpreted as the landfill contaminants are present in the A-Aquifer at the upper panhandle. If dissolved metals are detected, this will indicate that the groundwater may have been impacted and the data will be used in the RI/FS and the RD process by another Navy contractor.

3. Provide data from the A-Aquifer to evaluate the effectiveness of the PCB Hot Spot Area removal action.

   If PCBs or TPH are detected in the A-Aquifer, the data will be interpreted as the PCB Hot Spot area removal action may not have been fully effective.

4. Provide data to evaluate whether A-Aquifer groundwater beneath the metal slag excavation area of the Parcel E-2 panhandle has been impacted by metals.

   If dissolved metals are detected, this will indicate that the groundwater may have been impacted and the data will be used in the RI/FS and the RD process by another Navy contractor.

DQO Step 3. Identify the Information Inputs:

The data needed to accomplish the objectives of this SAP are analytical results of grab groundwater samples to be collected from 56 temporary wells and 7 existing piezometers. Also, field observations occurring during drilling and sampling activities will be considered.

No secondary data was used in developing this SAP or will be used in preparing the Technical Memorandum.

DQO Step 4. Define the Boundaries of the Study:

The lateral boundary of this investigation is the Parcel E-2 boundary as shown on Figure 2.

The vertical boundary is the bottom of the A-Aquifer beneath Parcel E-2 approximately 10-20 feet below ground surface.

The temporal boundary for this investigation is the first quarter of 2008.

DQO Step 5. Develop the Analytic Approach:

The 63 sampling locations (56 temporary wells and 7 existing piezometers) were selected to meet the study goals. Many of the sample locations are intended to provide data to address more than one of the study goals. Data generated by this investigation are intended to be used to supplement the remedial alternative assessment being prepared in the Parcel E-2 RI/FS.

Goal 1: Provide data to evaluate whether landfill contaminants are present in A-Aquifer groundwater at the shoreline.

Grab groundwater samples will be collected from 20 temporary wells with about 50-ft spacing along approximately 1,000 feet of upper panhandle and landfill area shoreline. Grab groundwater samples will also be collected from 7 existing piezometers located along the southern edge of the landfill area (PZ-131F, PZ-138E, PZ-138F, PZ-144E, PZ-150D, PZ-150E, and PZ-161D). The samples will be analyzed for PCBs, Total Petroleum Hydrocarbons (purgeables and extractables), ammonia, and dissolved metals.

If PCBs, TPH, or ammonia are detected above the MDL in groundwater samples collected from any of the piezometers, then the data will be interpreted to indicate that the landfill contaminants are present in the A-Aquifer at the shoreline. The data will be used in the RI/FS and the Remedial Design (RD) process by another Navy contractor.

If dissolved metals are detected above the MDL in groundwater samples collected from any of the temporary well locations, this will indicate that the groundwater may have been impacted and the data will be used in the RI/FS and the RD process by another Navy contractor.

Goal 2: Provide data to evaluate whether landfill contaminants are present in A-Aquifer groundwater at the upper panhandle.

Grab groundwater samples will be collected from 26 temporary wells located on a grid covering the upper panhandle area. Locations are spaced about 50 feet apart following the north half of the southwest border of the landfill. The remaining locations are on a grid with about 100-ft spacing located in the parcel interior southwest of the landfill. The samples will be analyzed for PCBs, Total Petroleum Hydrocarbons (TPH) (purgeables and extractables), ammonia, and dissolved metals.

If PCBs, TPH, or ammonia are detected above the MDL in groundwater samples collected from any of the temporary well locations, then the data will be interpreted to indicate that the landfill contaminants are present in the A-Aquifer at the upper panhandle area. The data will be used in the RI/FS and the RD process by another Navy contractor.

Goal 3: Provide data from the A-Aquifer to evaluate the effectiveness of the PCB Hot Spot Area removal action.

Grab groundwater samples will be collected from five temporary well locations on 50-foot spacing roughly parallel with the shoreline and in the southern end of the PCB Hot Spot area. The samples will be analyzed for PCBs and TPH (purgeables and extractables).

If the constituents mentioned above are detected above the MDL in groundwater samples collected from any of the temporary well locations, then the data will be interpreted to indicate that the PCB Hot Spot area removal action was not fully effective. The data will be used in the RI/FS and the RD process by another Navy contractor.

Goal 4: Provide data to evaluate whether A-Aquifer groundwater beneath the metal slag excavation area of the Parcel E-2 panhandle has been impacted by dissolved metals.

Grab groundwater samples will be collected from five temporary wells located with 50-100-foot spacing within the metal slag area excavation located near the southern end of the panhandle. The samples will be analyzed for dissolved metals.

If dissolved metals are detected above the MDL in groundwater samples collected from any of the temporary well locations, this will indicate that the groundwater may have been impacted and the data will be used in the RI/FS and the RD process by another Navy contractor.

DQO Step 6. Specify the Performance or Acceptance Criteria:

Because a judgmental sampling strategy will be used, statistically derived acceptance criteria on sampling design error are not quantifiable. To minimize sampling error, groundwater sampling will be conducted using the same field sampling and handling methods, and to the extent appropriate, in a manner consistent with historical sampling methods. To minimize analytical error, standard analytical methods and Naval Facilities Engineering Service Center (NFESC)-approved laboratories will be used. The data will be evaluated based upon the data quality indicators, primarily precision and accuracy, as discussed below.

DQO Step 7. Develop the Plan for Obtaining Data:

Data used to meet the DQOs will consist of grab groundwater samples collected from temporary wells and existing piezometers that are screened in the A-Aquifer. By using direct push technology and temporary wells as opposed to installing permanent monitoring wells, available budget is leveraged to increase the density of sampling locations, reduce the amount of investigation-derived waste, and expedite sample collection. Use of existing piezometers reduces the number of drilling locations.

SAP Worksheet #12 -- Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Trip Blank	Total Petroleum Hydrocarbons (TPH) - purgeables	One per team/TPH-purgeables cooler/day	Accuracy/Bias Contamination	No target compounds ≥ QL	S
Field Duplicate	Polychlorinated Biphenyls (PCBs)	One per every 10 field samples	Precision – Overall	≤30 relative percent difference (RPD)	S
Field Duplicate	TPH - purgeables	One per every 10 field samples	Precision – Overall	≤30 RPD	S
Field Duplicate	TPH - extractables	One per every 10 field samples	Precision – Overall	≤30 RPD	S
Field Duplicate	Dissolved metals	One per every 10 field samples	Precision – Overall	≤30 RPD	S
Field Duplicate	Ammonia, as nitrogen	One per every 10 field samples	Precision – Overall	≤30 RPD	S

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SAP Worksheet #13 -- Secondary Data Criteria and Limitations Table

Not applicable. No secondary data was used in the development of this SAP or will be used in the Technical Memorandum reporting results from this investigation.

Secondary Data	**Data Source** (originating organization, report title and date)	**Data Generator(s)** (originating organization, data types, data generation / collection dates)	**How Data Will Be Used**	**Limitations on Data Use**

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SAP Worksheet #14 -- Summary of Project Tasks

Preparatory Activities: Prior to beginning field work the U.S. Navy Remedial Project Manager (RPM), Resident Officer in Charge of Construction (ROICC), and the appropriate Hunters Point Shipyard (HPS) security and fire department personnel will be notified regarding anticipated work. All sampling personnel will review the appropriate sections of the Sampling and Analysis Plan (SAP) and sign the project sign-off sheet. All affected personnel will read the Accident Prevention Plan and associated Site-Specific Health and Safety Plan. They will also attend required HPS Radiation Awareness Training conducted by Tetra Tech EC.

Utility Clearance: Underground Service Alert will also be notified in advance at least two full working days prior to any excavation/drilling/coring activity. The investigation area will be geophysically surveyed in advance of implementing the SAP to identify potential obstructions or utilities at direct-push locations and sampling locations will be modified as necessary.

Mobilization: Mobilization activities will consist of site preparation, movement of equipment and materials to the site, and orientation of field personnel (including any on-site safety training/orientation).

Temporary Well Installation: 56 direct-push boreholes will be advanced at locations shown in Figure 2 in accordance with procedures presented in WS #17 under "Soil Coring" and "Temporary Well Installation" to place temporary wells for one-time grab groundwater sampling from the A-Aquifer. Continuous core will be retrieved and logged from six locations in the north central panhandle to better determine the depth of the A-Aquifer in that area. In lieu of using a short (one foot long) Hydropunch screen, a 0.75-inch outer diameter well casing with a 5 to 10 foot long well screen installed will be installed in each borehole and the borehole annulus will be filled with a sand pack up to about 2 feet about the top of the well screen. The top of each borehole will be sealed using bentonite.

Groundwater Sampling: Grab groundwater samples will be collected from the 56 temporary wells and 7 piezometers in accordance with the procedures described in WS #17. Sample locations fall into one of four groups based on the suite of analyses being performed/well construction; a) 46 temporary wells outside of the PCB Hot Spot area and metal slag area, b) 7 piezometers outside of the PCB Hot Spot area and the metal slag area, c) 5 temporary wells within the PCB Hot Spot area, and d) 5 temporary wells within the metal slag area. The suite of analyses to be performed are dependent on location as presented in WS #18. The number and type of containers and preservation methods for samples collected are based on analyses to be performed as described in WS #19.

Temporary Well Decommissioning: Well casing will be removed and the boreholes will be backfilled with grout in accordance with procedures described in WS #17.

Location Surveying: All boring locations and associated ground surface elevations will be surveyed by a surveyor licensed by the State of California as described in WS #17. Ground surface and top of casing elevations and horizontal locations were surveyed by others and preparation/presentation of that data is not part of this scope of work. All seven piezometers will be surveyed for location, ground surface and top-of-casing elevations as well.

Equipment Decontamination: Decontamination will be performed on direct-push drilling rods and water level measurement probes as described in WS #17. No other equipment is planned for use that will come into contact with contaminated subsurface media. Sample collection tubing will be used only at dedicated locations and will be disposed of as Investigation-Derived Waste (IDW). Radiation screening will be performed on equipment, tools and personnel in accordance with the protocols set forth by another Navy contractor in charge of performing radiation training and screening.

Investigation-Derived Waste (IDW) Management: IDW for this project will include soil core from soil borings, equipment decontamination water (rinsate), PVC casing used for temporary wells, and PPE (e.g. gloves, Tyvek, etc.) WS #17 describes procedures for how this waste will be stored, labeled, and indicates that manifesting and disposal will be coordinated with the Navy Resident Officer in Charge of Construction (ROICC). A project-specific work instruction will be develop and issued by Tetra Tech EC presenting specific details of radiation screening and related waster handling procedures.

Field Procedures Quality Assurance Audit: A Technical Systems Audit (TSA) will be conducted in the field observing soil boring and temporary well installation and observing grab groundwater sampling. This will be conducted at a minimum of one time during the project and corrective actions will be implemented as soon as possible. The TSA will be documented on the form following WS #31.

Analysis Tasks: Off-site analysis of groundwater samples for: PCBs (EPA Method 8082), dissolved metals (EPA Methods 6010B/7470A), TPH-purgeables and TPH-extractables (EPA Method 8015B), ammonia as nitrogen (EPA Method 350.1) in accordance with location specific requirements as presented in WS #18

Quality Control Tasks: The following field QC samples will be submitted for analysis: field duplicates and trip blanks. Field duplicates will be collected at a frequency of one per every 10 field samples (or 10 percent). Trip blanks will be submitted to the laboratory in every sample cooler containing samples to be analyzed for TPH-purgeables, and will be analyzed for TPH-purgeables by EPA Method 8015B. As appropriate to the analytical method, the following laboratory QC samples that will be used for this project consist of: method blanks, matrix spikes, matrix spike duplicates, laboratory control spikes, duplicates, surrogates, internal standards, and other applicable QC in accordance with the analytical method. See Worksheets #20 and #28.

Secondary Data: No secondary data will be used in the Technical Memorandum reporting results from this investigation.

Data Management Tasks: The project analytical laboratory will provide electronic data deliverables (EDD) for analytical results in compliance with Environmental Work Instruction (EWI) No. 6 (Navy, 2005). An automated laboratory information management system (LIMS) will be used to produce the EDDs. The laboratory will also prepare full (Level IV) data package deliverables, which include the following: containing the information from the summary data package, as well as initial and continuing calibration data, chromatograms, and associated raw data. The EDDs will provide the same information as the hard copy data. EDDs will be prepared in Naval Electronic Data Deliverable (NEDD) format and submitted to the Naval Installation Restoration Information Solution (NIRIS) database as soon as the data generated from the study is checked and compiled. The electronic data deliverables will be submitted to the Navy within 30 days after the final data validation has been completed.

Documentation and Records: Soil coring information including drilling methods, core descriptions, and temporary well construction details will be recorded on location-specific soil boring log (attached following WS #17). Grab groundwater sampling information such depth to water level measurements, sampling time and analytical methods being collected for, sample ID numbers, sampling personnel and other relevant observations, will be recorded on a location-specific bases within the sampling personnel field notebooks. Chain-of-custody records will be prepared for all samples shipped to the analytical laboratory. A copy of the chain of custody form follows WS #17.

Data Review Tasks: The laboratory will verify EDDs internally before final submittal. Analytical data generated by the laboratory will undergo an internal QC review prior to release of the reported data. Analytical data will be validated by an independent third-party data validation subcontractor, Laboratory Data Consultants (LDC). The data validation process consists of a systematic assessment and verification of data quality. The data validation process consists of a technical review of the analytical data, and provides information on the analytical limitations of data, based on specific QC criteria. The data validation process will be used to assess and document the performance of field and laboratory procedures. Data validation will be in accordance with EPA CLP *National Functional Guidelines for Organic Data Review* (EPA, 1999) and EPA CLP *National Functional Guidelines for Inorganic Data Review* (EPA, 2004). Approximately 80 percent of the data will undergo Level III data validation and 20 percent of the data will undergo Level IV validation. Validated data (hard copy reports and EDDs) will be reviewed by the Project Chemist. The data quality assessment is the process in which field and laboratory data are examined and evaluated to varying levels of detail and specificity by the qualified project and laboratory personnel and includes verification, validation, and usability assessment in terms of the PARCCS criteria. Data quality assessment will include an assessment of the results from field and laboratory QC. The Technical Memorandum will include an assessment of data usability, data limitations, and a comparison with project objectives. Data will be placed in tables, figures and graphs.

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SAP Worksheet #15 -- Reference Limits and Evaluation Table

Matrix: Water
Analytical Group: Polychlorinated Biphenyls – U.S. EPA Method 8082

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference[1]	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Aroclor -1248	12672-29-6	0.5	MCL (California/Federal)	0.2	0.5[2]	0.09
Aroclor 1254	11097-69-1	0.5	MCL (California/Federal)	0.2	0.5[2]	0.20
Aroclor -1260	11096-82-5	0.5	MCL (California/Federal)	0.2	0.5[2]	0.09

Matrix: Water
Analytical Group: Metals – U.S. EPA Methods 6010B/7470A

Analyte	CAS Number	Project Action Limit (µg/L)[1]	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Aluminum	7429-90-5	1,000	Maximum Contaminant Level (MCL) (California)	100	100	19.3
Antimony	7440-36-0	6	MCL (California/Federal)	5.0	5.0	1.84
Arsenic	7440-38-2	10	MCL (Federal)	5.0	5.0	2.45
Barium	7440-39-3	504	HGAL	5.0	5.0	0.75
Beryllium	7440-41-7	4	MCL (California/Federal)[3]	1.0	2.0[2]	0.24
Cadmium	7440-43-9	5	MCL (California/Federal)	2.0	5.0[2]	0.51
Chromium	7440-47-3	15.66	HGAL	5.0	5.0	1.37
Cobalt	7440-48-4	20.8	HGAL	5.0	5.0	0.63
Copper	7440-50-8	28	HGAL	5.0	5.0	0.97
Lead	7439-92-1	8.1	Aquatic Criteria	2.0	5.0[2]	1.85
Manganese	7439-96-5	8,140	HGAL	100	5.0	1.23
Mercury	7439-97-6	0.6	HGAL	0.1	0.2[2]	0.064
Nickel	7440-02-0	8.2	Aquatic Criteria	5.0	5.0	3.61
Selenium	7782-49-2	14.5	HGAL	5.0	5.0	3.17
Silver	7440-22-4	7.43	HGAL	1.0	1.0	0.73
Thallium	7440-28-0	12.97	HGAL[3]	2.0	5.0[2]	1.97
Zinc	7440-66-6	75.68	HGAL	10	50[2]	2.3

Matrix: Water
Analytical Group: Others

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference[1]	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Ammonia, as nitrogen	7664-41-7	350	QL[4]	350	350	122
TPH-gasoline	8006-61-9	20	QL[5]	100	20	8.6
TPH–diesel	68834-30-5	50	QL[5]	100	50	40.4
TPH-motor oil	68476-77-7	500	QL[5]	100	500	106

(1) Analytic results will be used for developing remedial alternatives in the Parcel E-2 RI/FS. The PALs in this worksheet are selected based on the lowest analyte-specific value for the following four standards except where noted:

- MCL (California) = Primary Maximum Contaminant Level, California Department of Health Services Drinking Water Standards.
- MCL (Federal) = Primary Maximum Contaminant Level, U.S. EPA, Drinking Water Standards.
- Aquatic Criteria as presented in the *Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) Basewide Groundwater Monitoring Program* , Hunters Point Shipyard, San Francisco, California Tetra Tech, Inc., August 2004.
- HGAL = Hunters Point Groundwater Ambient Levels, PRC Environmental Management, Inc. Technical Memorandum, September 1996.

(2) QL below PAL but above PQLG. QL is lowest achievable limit for analytical method performed by selected laboratory. MDL is lower than PQLG. Concentrations detected between MDL and QL will be flagged as "estimated value".

(3) Lowest PAL criteria reference cannot be achieved by analytical laboratory QL. Selected next lowest PAL reference.

(4) Ammonia as nitrate does not have an MCL or HGAL value. Analytical laboratory cannot quantify or detect ammonia as nitrate as aqutic criteria concentration of 35 µg/L. Therefore PAL set at analytical laboratory QL of 350 µg/L

(5) No regulatory criteria have been established for Total Petroleum Hydrocarbon (TPH) at Hunters Point Shipyard. Therefore the QL is used as the PAL and PQLG for TPH analyses.

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SAP Worksheet #16 -- Project Schedule / Timeline Table

No regulatory due dates have been established for completion of this work. Therefore, deliverable due dates are based on the forecasted date of completion. Dates of initiation and completion are based on the assumption that the work plan and associated safety plans will be approved by February 1, 2008. Actual work schedule is dependent on weather condition, release of radiation safety work instruction from other Navy contractor, and regulatory review time.

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Review work plan	Navy and regulatory agencies	11/21/07	02/01/08	Work plan approval	02/01/08
Groundwater sampling	CE2-Kleinfelder JV	02/11/08 1 week following approval of work plan.	03/10/08 4 weeks following start of sampling.	Not applicable.	Not applicable.
Laboratory analyses	APPL	02/12/08 Day following submittal of first samples.	03/24/08 Approximately 2 weeks following submittal of last sample.	Level IV data package deliverables and electronic data deliverables	03/25/08
Data validation	LDC	04/01/08 One week following submittal of data package deliverable and electronic data deliverable.	05/15/08 6 weeks following submittal of last sample delivery group analytical report.	Data validation reports (hardcopy and electronic data deliverable)	05/16/08
Prepare Draft Technical Memorandum	CE2- Kleinfelder JV	05/16/08	06/13/08 4 weeks following receipt of final data validation report.	Draft Technical Memorandum	06/16/08
Navy and regulatory review	Navy, EPA, DTSC, RWQCB	06/16/08	07/31/08 Assumes 45 day review period.	Review comments	08/01/08
Prepare Final Technical Memorandum	CE2-Kleinfelder JV	08/01/08	08/18/08	Final Technical Memorandum	08/19/08

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SAP Worksheet #17 -- Sampling Design and Rationale

The goals of this study are presented below. All of these goals are intended to provide supplemental data for the RI/FS and evaluation of remedial alternatives for Parcel E-2.

1. Provide data to evaluate whether landfill contaminants are present in A-Aquifer groundwater at the shoreline.
2. Provide data to evaluate whether landfill contaminants are present in A-Aquifer groundwater at the upper panhandle.
3. Provide data from the A-Aquifer to evaluate the effectiveness of the PCB Hot Spot Area removal action.
4. Provide data to evaluate whether A-Aquifer groundwater beneath the metal slag excavation area of the Parcel E-2 panhandle has been impacted by metals.

The site investigation will be implemented using the following approach:

1. Collect grab groundwater samples from 56 temporary wells set in the A-Aquifer using Direct Push Technology (DPT) to advance boreholes.
2. Collect grab groundwater samples from seven existing piezometers screened in the A-Aquifer.

The following sections describe the design of the sampling process to be used for this groundwater sampling project at Parcel E-2.

Groundwater Investigation Design

This groundwater investigation will be performed using the following general approach to achieving these objectives:

1. Evaluate existing boring logs and piezometer locations within the Parcel E-2 Study Area.
2. For locations where geologic control is lacking, use DPT techniques to collect core samples for visual description.
3. Install temporary wells and collect grab groundwater samples from the A-Aquifer.
4. Collect grab groundwater samples from existing piezometers screened in the A-Aquifer.

The following sections present more details on the individual components of the investigation design. Descriptions of the sampling methodologies and equipment are also presented.

Sampling locations are shown on Figure 2. SAP Worksheet #18 lists the sampling locations and analytical groups that will be used.

The following describes the procedures and processes for obtaining representative samples.

Work will be performed in a Radiation Control Area and as such, all personnel will complete Radiation Awareness Training provided by Tetra Tech EC (TtEC). Radiation training, and monitoring of personnel, tools, material, equipment, and IDW will be conducted by TtEC. This will include directing requirements for site access/egress and tools, materials, equipment, storage and associated decontamination.

Sampling Methods

Groundwater sampling will be conducted from temporary wells installed using DPT and from existing piezometers

Location preparation

Sampling locations are away from paved roads, but are on relatively level ground surface and do not currently require brush removal. Brush removal and gravel filling of localized shallow ground depressions to improve sampling location access will be performed if necessary.

Utility line clearance

No utilities are documented or suspected in the vicinity of the sampling locations. However, Underground Service Alert (1-800-227-2600) will be contacted at least two full working days prior to the start of drilling activities to communicate locations of planned drilling activities. Prior to any drilling, the investigation area will also be geophysically surveyed for buried utilities and metal objects to minimize chances of encountering obstructions and the sampling locations will be adjusted accordingly.

Direct-Push Technology

DPT will be used to obtain soil cores and groundwater samples. DPT uses a truck- or track-mounted hydraulic/percussion system to push 1.75-inch diameter steel rods to the desired temporary well completion depth. Depth to water level measurements relative to ground surface will be made after temporary well installation to confirm interception of the A-Aquifer.

Although the sampling locations are being geophyscially surveyed in advance of drilling, buried obstructions consisting of non-metallic materials (e.g. rock, wood debris) may still be encountered. If an obstruction is encountered that prevents pushing the rods to the planned depth, up to two new locations will be tried within a 15 foot radius of the initial location. If all three attempts are made and rods cannot be pushed at least to within 5 feet below static groundwater, the location will not be sampled and noted as having encountered refusal.

Soil Coring

A core barrel will be used at six locations (Figure 2) to retrieve continuous soil cores from the ground surface to the targeted temporary well depth of 10 feet below the static water table but no deeper than the top of the Bay Mud. Anticipated total depth of temporary wells will be 10 to 20 feet below ground surface (bgs).

The cores will be described and relevant information recorded on a location-specific boring log (attached following this worksheet). All materials recovered from the borehole will be classified using the Unified Soil Classification System (USCS).

Temporary Well Installation

Temporary wells will be installed at 56 locations. Proposed locations are shown on Figure 2 and include the six coring locations.

In addition to the six coring locations, a 1.75-inch diameter direct push rod will be advanced to a depth targeted at about 10 feet below static A-Aquifer water level as determined at the start of drilling by measuring water levels in permanent A-Aquifer monitoring wells closest to the drilling locations. The total depth of borings will not extend below the top of the underlying Bay Mud Aquitard as determined either from the total depth of nearby A-Aquifer monitoring wells or from soil coring performed under this scope of work. A temporary well will be constructed with a 0.75-inch outer diameter well screen with 0,02-inch slot size. Well screen length will be 5-10 feet. The well casing will be installed within the direct-push rods. The rods will be retrieved, leaving the temporary well in place. A sand pack using #2/16 sand will be installed to two feet above the screen interval after the rods are retrieved. An initial depth to water measurements will be taken after the casing and sand pack have been installed. Temporary well construction details including date installed, field personnel, drilling method, borehole diameter, total borehole depth, completed well depth, screen length, well material specifications, and post-installation water level and time of measurement will be recorded on the same boring log form as the soil core locations.

The annular space near ground surface will be sealed for the duration of sampling by placing polyethylene sheeting into the upper portion of the borehole annulus and sealing it in place with hydrated bentonite chips or powder to prevent surface materials from entering the borehole.

Groundwater Sampling from Temporary Wells

Groundwater sampling personnel will measure water levels in temporary wells and record them and measurement time in a bound field notebook with numbered pages. Once the water level has risen at least three feet above the well bottom, a well-specific, disposable, Teflon-lined polyethylene tubing will be lowered to within one foot of the bottom of the temporary well. Grab groundwater samples will then be collected using a peristaltic pump located at the ground surface.

If the water level has not risen at least three feet above the well bottom after four or more hours of well installation, the sample tubing will be lowered as far down into the well as necessary to obtain water for sample collection.

Grab groundwater samples will be collected by pumping the well at a low-flow rate of <500 mL/minute to minimize turbidity and potential degassing of lighter petroleum hydrocarbons. Grab samples, by definition, do not involve pre-collection purging and therefore monitoring of stabilization parameters is not applicable to this scope of work. Samples will be collected in the following order:

1. TPH-purgeables.
2. TPH-extractables
3. Ammonia, as nitrogen.
4. PCBs.
5. Dissolved metals.

If the depth to water draws down below the reach of the sample collection tubing prior to completing location-specific sampling, a depth to water measurement and associated time will be recorded on the sampling log and the location will be designated in the sampling log as having run dry. Remaining samples will be collected on subsequent days as water recharges into the well. If necessary, the tubing will be lowered closer to the well bottom to obtain sufficient water for sample collection. Notations will be in the field notebook regarding any interruption of sample collection due to insufficient water volume.

Samples for dissolved metals analysis will be collected in containers without preservative and the analytical laboratory will be instructed to perform sample filtering using a 0.45 micron filter prior to performing analyses.

Samples will be collected directly into pre-cleaned, laboratory-supplied sample containers as described in Worksheet # 19.

Documentation of water sampling will be made in each sampling crew's respective field notebook including depth to water measurements and time recorded, time of sample collection, and other observations as appropriate.

Temporary Well Decommissioning

The temporary surface seal and well screens will be removed as soon as possible after groundwater sampling is complete,. Well removal will be accomplished by using a winch to pull casing out of the boreholes. The boreholes will then be backfilled with neat Portland Type I/II cement grout. Tremie pipe will be used to place grout below water - where the borehole depth exceeds 20 feet.

Groundwater Sampling from Existing Piezometers

Grab groundwater samples will be collected from the seven existing piezometers shown on Figure 2, which are constructed of 1.-5-inch OD stainless steel. Groundwater samples will be collected in the same manner as those collected from the temporary wells described above except that groundwater sampling will be initiated regardless of initial water level.

Sample Containers and Holding Times

Sample containers, preservation, and holding time requirements will be according to the requirements presented in Worksheet #19. The analytical laboratory will provide certified, clean sample containers for the required analyses. These containers must meet EPA standards as

described in "Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers" (EPA, 1992).

Sample Handling and Custody

The following sections describe sample identification, labeling, and documentation.

Sample Identification

Samples collected during the project will be assigned a unique sample identification number that will reference the temporary well location or piezometer. The sample numbering system will be compatible with the computerized data management system and will allow the sample to be tracked from collection through laboratory analysis. Samples collected from the existing piezometers will be named using the same system.

The sample identification numbers will be recorded electronically or written in the field notebook, and on the COC form to track the sample throughout the process.

The field QC samples for this project are field duplicates, MS/MSDs, and trip blanks. Additional sample volume will be collected for MS/MSD groundwater samples. Field QC samples will be tracked in the field notebook or field sampling forms.

Sample Labels

Sample labels will be completed using indelible ink and will be affixed to sample containers at the time of sample collection. Sample labels will contain the following information, at a minimum:

- Sample location.
- Sample identification number.
- Date of sample collection (month/day/year).
- Time of sample collection (24-hour clock).
- Sampler's initials.

Sample Documentation

To ensure that analytical results are correctly matched with field locations, field personnel will maintain field documentation following the general procedure outlined below.

- Documentation will be completed in permanent black or blue ink.
- Entries will be legible.
- Errors during documentation will be correcting using a single line strike-through, followed by the date and field personnel initials.
- Unused portions of pages will be crossed out, and the last page for each day will be signed and dated.

Decontamination

Non-disposable, non-dedicated field equipment used upstream of sample collection, including direct-push drill rods, will be cleaned and decontaminated after each use to obtain representative samples and to reduce the possibility of cross-contamination. The following procedure will be used:

1. Steam clean drill rods (exterior and interior).
2. Rinse with potable water and allow to air-dry.
3. Containerize decontamination water pending characterization and disposal.

Decontamination of water-level probes will use the following procedure:

1. Wash with non-phosphate detergent and water solution (e.g. Alconox or Liqui-Nox solutions made as directed by the manufacturer).
2. Rinse with potable water.
3. Rinse twice with deionized water and allow to air-dry.
4. Containerize decontamination water pending characterization and disposal.

Location Surveying

Each temporary well location will be surveyed by a professional land surveyor, licensed by the State of California. The surveyor will provide the elevation at backfilled ground surface for each temporary well location to a precision of 0.01 ft and its location to a precision of plus or minus 0.1 ft horizontally, based on the borehole center. Additionally, the location, ground surface elevation and top-of-casing elevation for the seven piezometers will also be surveyed. The elevations will be surveyed relative to the 1929 National Geodetic Vertical Datum. The boring locations will be surveyed using the 1927 North American Datum State Plane Coordinate System, California, Zone 3. Vertical coordinates will be reported as feet relative to mean sea level.

Management of Investigation-Derived Waste

Investigation-Derived Waste (IDW) will be handled and disposed of in accordance with the Resource and Recovery Act (RCRA) Title 40, Code of Federal Regulations, Parts 260-270 and 273. Additionally, disposition and manifesting of IDW will be coordinated with the Navy Resident Officer in Charge of Construction (ROICC). A project-specific work instruction will be developed and issued by Tetra Tech EC presenting specific details of radiation screening and related waste handling procedures.

The IDW for this project will include soil core from soil borings, equipment decontamination water (rinsate), PVC casing used for temporary wells, and PPE (e.g. gloves, Tyvek, etc.).

Soil core will be stored in core boxes pending radiation screening and release. If the soil passes radiation screening, it will be transferred to a lined and covered U.S Department of

Transportation (DOT)-approved 55-gallon drum and kept onsite at Parcel E-2, profiled and disposed of by a licensed waste hauler or, if appropriate, in conjunction with other HPS site waste.

Equipment decontamination rinsate will be collected in covered DOT-approved 55-gallon drums and transported to the CE2-Kleinfelder JV field office where it will be transferred into the 4,000-gallon Baker tank used for storing purgewater from the Basewide Groundwater Monitoring Program and managed according to the IDW Management Plan for those activities.

Regular trash and non-hazardous debris will be segregated to the extent possible. Non-contaminated personal protective equipment (PPE) will be placed in waste bins. Contaminated PPE will be separated and place in lined and covered DOT-approved 55-gallon drums pending disposal.

Each container will be clearly marked and labeled to indicate the waste source. The label will be white with black lettering and weather resistant. The labels will not be used for shipping or disposal purposes. Before disposal of shipment offsite, containers will be labeled with the appropriate DOT identification and classification information by the waste disposal contractor. Labels will include at a minimum the following information:

- Contract number.
- Project location.
- Installation point of contact.
- Site-specific location(s).
- Owner.
- Project Manager.
- Navy RPM.
- Container identification number.
- Contents.
- Date(s) container filled.

CE2-Kleinfelder will inspect the condition of the storage area and containers weekly until the waste is disposed of.

CE2-Kleinfelder will collect characterization samples of any solid waste for analysis and profiling. Solid IDW will be disposed of offsite within 90 days of the last placement of waste in the container. The waste disposal contractor will provide services including, but not limited to, final DOT labeling, manifesting, and transportation of solid IDW. The Navy will select the methods and location of IDW disposal and sign the manifests.

The wastewater will be combined, managed, and disposed of according to the IDW Management Plan for the Basewide Groundwater Monitoring Program (Kleinfelder, 2004).

Other solid waste generated during purging and sampling activities will include PPE and miscellaneous trash. This waste will be disposed of as non-regulated solid waste.

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KLEINFELDER

BORING LOG

HOLE NO.	PROJECT NO.	PROJECT	SHEET OF
MFG. DESIGNATION OF DRILL		LOCATION	

TYPE OF BIT	HAMMER DATA: WT. LBS. DROP INCHES	ELEV.	TOTAL DEPTH OF HOLE
DATE STARTED	DRILLING AGENCY		
DATE COMPLETED	INSPECTOR	GROUNDWATER DEPTH ____ TIME ____	
DATE BACKFILLED	CREW	____ ____	
SURFACE CONDITIONS		____ ____	

DIST. FROM SURF.	LEGEND	SAMPLE TYPE	SAMPLE NO.	RECOVERY	BLOWS PER 6 IN.	USCS	LOG OF MATERIAL
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							

SHEET ___ OF ___ HOLE NO. ___

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CHAIN OF CUSTODY RECORD

APPL, Inc.
4203 W. Swift
Fresno, CA 93722

Phone: (559) 275 2175

Fax: (559) 275-4422

C.O.C. Nº _____

Report to: *PLEASE PRINT*		Invoice to: *PLEASE PRINT*	
Company Name	Phone:	Company Name	Phone:
Address	Fax:	Address	Fax:
Attn:		Attn:	

Project Name/Number	Sampler (Print)	Analysis Requested/Method Number	Date Shipped:
Purchase Order Number	Sampler (Signature)		Carrier:
			Waybill No.:
			Comments:

Sample Identification	Location	Date Collected	Time Collected	Matrix	Number of Containers

Shuttle Temperature:	Turnaround Requested: MUST CHECK ONE	Sample Disposal:
	☐ Standard (2-3 week) ☐ One week ☐ 24-48 hour	☐ Return to client ☐ Disposal by Lab (30-day retention)

Relinquished by sampler:	Date	Time	Received by:	Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:	Relinquished by:	Date	Time	Received at lab by:

White: Return to client with report Yellow: Laboratory Copy Pink: Sampler

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SAP Worksheet #18 -- Sampling Locations and Methods/SOP Requirements Table

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates) [3]	Sampling SOP Reference
Temporary well[4] location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	SAP Worksheet (WS) #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates) [3]	Sampling SOP Reference
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates)[3]	Sampling SOP Reference
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates) [3]	Sampling SOP Reference
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates) [3]	Sampling SOP Reference
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates)[3]	Sampling SOP Reference
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates)[3]	Sampling SOP Reference
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates)[3]	Sampling SOP Reference
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates) [3]	Sampling SOP Reference
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates) [3]	Sampling SOP Reference
Temporary well location (outside of PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Piezometer PZ131F / TBD	Water	1 ft above bottom of well (7.4 ft below grade)	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Piezometer PZ138E / TBD	Water	1 ft above bottom of well (9.1 ft below grade)	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Piezometer PZ138F / TBD	Water	1 ft above bottom of well (16.7 ft below grade)	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Piezometer PZ144E /TBD	Water	1 ft above bottom of well (13.3 ft below grade)	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates) [3]	Sampling SOP Reference
Piezometer PZ150D / TBD	Water	1 ft above bottom of well (12.8 ft below grade)	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Piezometer PZ 150E / TBD	Water	1 ft above bottom of well (12.7 ft below grade)	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Piezometer PZ161D / TBD	Water	1 ft above bottom of well (15.1 ft below grade)	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Field duplicates (outside PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Field duplicates (outside PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates) [3]	Sampling SOP Reference
Field duplicates (outside PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Field duplicates (outside PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Field duplicates (outside PCB Hot Spot area and metal slag area) / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • Ammonia as nitrogen • PCBs • Dissolved metals	1 per analytical group	WS #17
Temporary well locations within the PCB Hot Spot area / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • PCBs	1 per analytical group	WS #17
Temporary well locations within the PCB Hot Spot area / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • PCBs	1 per analytical group	WS #17
Temporary well locations within the PCB Hot Spot area / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • PCBs	1 per analytical group	WS #17

Sampling Location / ID Number[1]	Matrix	Depth[2]	Analytical Group(s)	Number of Samples (identify field duplicates) [3]	Sampling SOP Reference
Temporary well locations within the PCB Hot Spot area / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • PCBs	1 per analytical group	WS #17
Temporary well locations within the PCB Hot Spot area / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • PCBs	1 per analytical group	WS #17
Field duplicate – within PCB Hot Spot area / TBD	Water	1 ft above bottom of well	• TPH-purgeables • TPH-extractables • PCBs	1 per analytical group	WS #17
Temporary well locations within the metal slag area / TBD	Water	1 ft above bottom of well	• Dissolved metals	1	WS #17
Temporary well locations within the metal slag area / TBD	Water	1 ft above bottom of well	• Dissolved metals	1	WS #17
Temporary well locations within the metal slag area / TBD	Water	1 ft above bottom of well	• Dissolved metals	1	WS #17
Temporary well locations within the metal slag area / TBD	Water	1 ft above bottom of well	• Dissolved metals	1	WS #17
Temporary well locations within the metal slag area / TBD	Water	1 ft above bottom of well	• Dissolved metals	1	WS #17
Field duplicates – within metal slag area / TBD	Water	1 ft above bottom of well	• Dissolved metals	1	WS #17

(1) Sample IDs are To Be Determined (TBD). They will be assigned in the field based on the following convention: XXYYA### where XX = last two digits of the year sampled (e.g. 08 for 2008), YY = week number (01 to 52), A = first initial of sampler's first name, ### = chronological number of sample taken by that sampler within the week (001, 002, 003…).

(2) Samples will be collected from about one foot above the bottom of each well or piezometer. Temporary well depth will range between about 10 – 20 feet below grade depending on local depth-to-water and ability of drilling equipment to penetrate subsurface materials. All wells will be constructed to collect samples from the A-Aquifer at their respective locations. Piezometer sample depths shown are based on one foot above sounded depths of wells. Samples may be collected from closer to well/piezometer bottom if necessary to submerged sample tubing.

(3) See WS #19 for analytical group-specific container type, quantity and preservation methods. Field duplicates will be taken in accordance with the frequency designated in Worksheet #20.

(4) Temporary well = Grab groundwater samples will be collected from temporary wells constructed as described in Worksheet #17. These wells are installed solely for the purpose of collecting grab groundwater samples for this one-time event and are not installed as points for long-term monitoring events.

SAP Worksheet #19 -- Analytical SOP Requirements Table

Matrix	**Analytical Group**	**Analytical and Preparation Method / SOP Reference**	**Containers** (number, size, and type)	**Sample volume** (units)	**Preservation Requirements** (chemical, temperature, light protected)	**Maximum Holding Time** (preparation / analysis)
Water	PCBs	U.S. EPA 3510C/8082 *SEP009/ANA8082*	(1) 1,000-mL amber glass bottle	1,000 ml	Cool, 4 ± 2 °C	7 days/ 40 days
Water	TPH-purgeables	U.S. EPA 5030B/8015B *ANA5030B/ANA8015G*	(3) 40-mL VOA vials with Teflon-lined septum	10 ml	Zero headspace HCl to pH ≤ 2 Cool, 4 ± 2 °C	14 days/7 days (if unpreserved)
Water	TPH-extractables	U.S. EPA 3510C/8015B *SEP011/ANA8015BD*	(1) 1,000-mL amber glass bottle	1,000 ml	Cool, 4 ± 2 °C	14 days
Water	Dissolved Metals	U.S. EPA 6010B/7470A *PRE3010A/PRE7470A* *ANA6010BBPE/ANA7470A*	(1) 500-mL Polyethylene container	100 ml	Cool, 4 ± 2 °C (laboratory will filter and acidify sample volume)	Hg: 28 days Others: 6 months
Water	Ammonia, as nitrogen	U.S. EPA 350.1 *ANA350.1*	(1) 250mL Polyethylene container	200 ml	H_2SO_4 Cool, 4 ± 2 °C	28 days

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SAP Worksheet #20 -- Field Quality Control Sample Summary Table

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates[1]	No. of MS/MSDs[2]	No. of Source Blanks[3]	No. of Equip. Blanks[3]	No. of VOA Trip Blanks[4]	No. of PT Samples[5]	Total No. of Samples to Lab[6]
Water	PCBs	58	7	4	Not applicable	Not applicable	Not applicable	Not applicable	69
Water	TPH-purgeables	58	7	4	Not applicable	Not applicable	1 per cooler	Not applicable	69 + trip blanks
Water	TPH-extractables	58	7	4	Not applicable	Not applicable	Not applicable	Not applicable	69
Water	Dissolved Metals	58	7	4	Not applicable	Not applicable	Not applicable	Not applicable	69
Water	Ammonia, as nitrogen	53	6	3	Not applicable	Not applicable	Not applicable	Not applicable	62

(1) Field duplicates will be collected on a basis of 1 per 10 field samples for each analytical group rounded up to the nearest 10 field samples.

(2) Matrix spike (MS) and matrix spike duplicate (MSD) samples will be collected on a basis of 1 per 20 field samples for each analytical group rounded up to the nearest 20 field samples.

(3) Source blanks and equipment blanks are not required for this scope of work because all sampling equipment coming in contact with groundwater will be new and disposed of per sampling location.

(4) Volatile Organic Analysis (VOA) trip blanks will only be necessary for coolers containing samples to be analyzed for volatile constituents (i.e. purgeable total petroleum hydrocarbons (TPH)).

(5) Proficiency Test (PT) will not be required for this scope of work.

(6) The number and type of QC samples will depend on the samples collected during a given field day.

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SAP Worksheet #21 -- Project Sampling SOP References Table

This project does not have stand alone SOPs. See SAP Worksheet # 17 for detailed field activity procedures

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments

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SAP Worksheet #22 -- Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference	Comments
Peristaltic sampling pump	Testing/Inspection – check that pump battery is charged and pump is operational	Daily	Charge is full. Pump is operational.	If pump not operational using battery, connect to AC outlet with adapter, to determine if rest of pump is operational and battery needs more charge/replacement.	Tom Sayre (or field designee)	Use manufacturer operation instructions	
	Maintenance	As needed	Pump is operational.	If pump is not operational with charged battery, exchange for spare pump (purchased or rental) and send non-operational pump to vendor for repair.	Tom Sayre (or field designee)	Use manufacturer operation instructions	Pump maintenance or replacement to be supported by equipment distributor (including rental equipment).
Water level meter	Testing/Inspection – check that meter battery is charged and meter is operational	Daily	Test button gives signal that meter is operational.	Change 12V battery.	Tom Sayre (or field designee)	Use manufacturer operation instructions	
	Maintenance	As needed	Meter is operational.	If meter is not operational with charged battery, exchange for spare pump (purchased or rental) and send non-operational pump tovendor for repair.	Tom Sayre (or field designee)	Use manufacturer operation instructions	Meter maintenance or replacement to be supported by equipment distributor (including rental equipment).

No field equipment requires calibration for this scope of work.

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SAP Worksheet #23 -- Analytical SOP References Table

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
ANA8082	PCBs and Congeners by EPA Method 8082, Rev 12, 3/08/07	definitive	PCBs	GC-ECD	APPL	N
ANA8015G	TPH by EPA Method 8015B, Rev 7, 7/24/07	definitive	TPH-purgeables	Purge/Trap + GC-FID	APPL	N
ANA8015BD	Total Extractable Petroleum Hydrocarbons –Diesel, Rev 14, 3/8/07	definitive	TPH-extractables	GC-FID	APPL	N
ANA6010BPE	Inductively Coupled Plasma (ICP) by EPA Method 6010B – Three Point Curve, Rev 8, 3/8/07	definitive	Metals	ICP	APPL	N
ANA7470A	Mercury by EPA Method 7470A, Rev 15, 9/05/05	definitive	Mercury	Cold vapor-Atomic Absorption (AA)	APPL	N
ANA350.1	Ammonia, EPA Method 350.1, Rev 6, 7/23/07	definitive	Ammonia	Colorimetric	APPL	N

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SAP Worksheet #24 -- Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC	Initial: Multi-point	Initially and as required per method	<20% relative standard deviation (RSD), r≥ 0.990	Re-run Initial Calibration Verification (ICV)	Laboratory QAM	SAP Worksheet (WS) #23
GC	Continuing: single point	Before and after every 10 samples or every 12 hours (per method)	±15% difference	Reanalyze bracketing samples	Laboratory QAM	WS #23
AA (Mercury analysis)	Initial: Multi-point (minimum 3 pt + blank)	Initially and as required per method	r≥ 0.990	Re-run ICV	Laboratory QAM	WS #23
AA (Mercury analysis)	Continuing: single point	Every 10 samples at beginning and end of sequence	±20% difference	Reanalyze bracketing samples	Laboratory QAM	WS #23
ICP	Initial: Blank + one standard or 3 point	Daily	r≥ 0.990	Re-run ICV	Laboratory QAM	WS #23
ICP	Continuing: single point	Every 10 samples at beginning and end of each sequence	<5% RSD	Reanalyze bracketing samples	Laboratory QAM	WS #23
Colorimetric, Photometric, Electrometric	Initial: Multi-point	Prior to analysis per method	r≥ 0.990	Re-run ICV	Laboratory QAM	WS #23
Colorimetric, Photometric, Electrometric	Continuing: single point	Every 10 samples at beginning and end of each sequence	±10% difference	Reanalyze bracketing samples	Laboratory QAM	WS #23

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SAP Worksheet #25 -- Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
GC	Liner insert, column, detector, traps	ICV / Continuing Calibration Verification (CCV)	N/A	As needed	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	SAP Worksheet (WS) #23
GC	Septa replacement	ICV / CCV	N/A	As needed	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
GC	Gas drying and purifying cartridges	ICV / CCV	N/A	When indicated to be necessary	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
AA (Hg analysis)	Gas flow, cell alignment slit width, photomultiplier voltage, lamp intensity	ICV / CCV	N/A	Daily, change as needed	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
AA (Hg analysis)	Graphite tubes, contact rings	ICV / CCV	N/A	Daily or as needed	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
AA (Hg analysis)	Burner head assembly and quartz cells	ICV / CCV	Visual for signs of contamination	Daily or as needed	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
AA (Hg analysis)	Tubing	ICV / CCV	Visual for deterioration	Daily or as needed	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
AA (Hg analysis)	Optical lenses	ICV / CCV	N/A	As needed	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
AA (Hg analysis)	Clean furnace windows	ICV / CCV	N/A	Quarterly or as needed	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
ICP	Aspirator assembly	ICV / CCV	N/A		Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
ICP	Pumps and tubing	ICV / CCV	Visual for deterioration		Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
ICP	Nebulizer and sample probe	ICV / CCV	Visual for signs of contamination		Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
ICP	Filters	ICV / CCV	Visual	Monthly	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23
ICP	Optics alignment	ICV / CCV	N/A	Quarterly or as needed	Method QA/QC criteria (WS #12)	Re-run ICV	Analyst	WS #23

SAP Worksheet #26 -- Sample Handling System

Sample Collection, Packaging, and Shipment
Sample Collection (Personnel/Organization): groundwater sampling field personnel / CE2-Kleinfelder JV
Sample Packaging (Personnel/Organization): Sample Management Coordinator / CE2-Kleinfelder JV
Coordination of Shipment (Personnel/Organization): Sample Management Coordinator / CE2-Kleinfelder JV
Type of Shipment/Carrier: courier / Agriculture & Priority Pollutants Laboratories, Inc. (APPL)
Sample Receipt and Analysis
Sample Receipt (Personnel/Organization): APPL designated sample custodian
Sample Custody and Storage (Personnel/Organization): APPL, designated sample custodian
Sample Preparation (Personnel/Organization): APPL, sample preparation personnel
Sample Determinative Analysis (Personnel/Organization): APPL organic and inorganic analytical chemists
Sample Archiving
Field Sample Storage (No. of days from sample collection): Field samples will be stored by the analytical laboratory for 30 days after the finalized data are reported.
Sample Extract/Digestate Storage (No. of days from extraction/digestion): Extraction time will be in with accordance analytical methods listed in QAPP Worksheet #19
Biological Sample Storage (No. of days from sample collection): not applicable
Sample Disposal
Personnel/Organization: laboratory waste disposal coordinator / APPL designated sample custodian
Number of Days from Analysis: 30 days after the analytical report has been mailed, unless there is a hold on a particular sample or previous arrangements have been made to hold onto a sample.

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SAP Worksheet #27 – Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):

Chain-of-custody (COC) procedures will be followed to document transfer of sample custody from field sampler to laboratory receipt. The COC records will accompany the samples from the field to the analytical laboratory. A sample is considered to be in custody if:

- The sample is in a person's physical possession or view.
- The sample is in a secure area with restricted access.
- The sample is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

The COC records will be included in the cooler used for preservation and transportation of the samples. When the samples are transferred from one party to another, the individuals involved in the transfer will sign, date, and record the time of transfer on the COC record. The COC records include the original top copy and two carbonless copies. The original and first copies are transmitted to the laboratory with the samples. The second copy is retained in files for the Project Field Coordinator and the Sample Manager. Hand-written notes identifying samples as blind duplicates or other QA/QC submittals are maintained on the last copy. If the COC records are generated electronically, the original COC records will be copied prior to placing inside sample coolers, and the copies will be retained in the files for the Project Field Coordinator and the Sample Manager.

The COC record will be completed by the sampler using waterproof ink. All corrections will be made by drawing a line through, initialing, and dating the error, and entering the correct information. If samples are to be delivered to the laboratory by an overnight carrier, the airbill number will be recorded, and the COC record(s) will be placed in a waterproof plastic bag that is taped to the lid inside the sample cooler prior to sealing.

Field personnel will record the following information on each COC record:

- Project name and number.
- Project contact and phone number.
- Sampling location.
- Name and signature of sampler or sample processor.
- Laboratory name.
- Sample identification number.
- Date and time of sample collection.
- Number and type of containers filled.
- Analyses requested.

- Filtering for metals analysis.
- Signatures of individuals involved in custody transfer, including the date and time of transfer.
- Airbill number (if applicable).

After samples are collected in the field, they will be prepared for transportation (as soon as possible) to the project laboratory for analysis. Field personnel will use the following procedures when packing and transporting samples to the laboratory:

- Use waterproof metal or equivalent strength plastic coolers for field samples.
- Check samples for proper labeling and sample information.
- Wrap each glass container in bubble wrap or similar material.
- Package wet ice or a combination of wet ice and blue ice in re-sealable bags and place a layer of ice bags at the bottom of the cooler.
- Package wet ice or a combination of wet ice and blue ice in re-sealable bags and place ice bags around and on top of the field samples.
- Put paperwork (i.e., associated COC records) in a re-sealable bag and tape it to the inside lid of the cooler.
- Tape and secure the container with packing tape.
- Place signed custody seals on the front of the cooler before the custody of the cooler is relinquished to the overnight carrier or courier.

Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal):

The analytical laboratories will have established custody procedures, which will include:

- Designation of a sample custodian.
- Completion by the custodian of the COC record, any sample tags, and laboratory request sheets, including documentation of sample condition upon receipt.
- Laboratory sample tracking and documentation procedures.
- Secure sample storage with the appropriate environment (e.g., refrigerated, dry).
- Proper data logging and documentation procedures, including custody of all original laboratory records.

Upon arrival of the samples, a sample custodian will take custody of the samples and carefully inspect sample labels and associated COC documentation. The custodian will receive incoming samples, sign the accompanying custody forms, and retain copies of the forms as permanent records. The condition of the samples will be checked and any signs of damage or tampering and temperature discrepancies will be documented on the Sample Receipt Form. If significant out-of-control conditions (e.g., unsealed, or broken container; temperature

exceedences) are noted at the time of sample receipt, the Project Chemist will be immediately notified.

The sample custodian is responsible for maintaining internal logbooks, tracking reports, and other records necessary to maintain custody throughout sample preparation and analysis. The laboratory shall restrict access to the storage areas to authorized laboratory personnel only, to prevent any unauthorized contact with samples, extracts, or documentation. The custodian will manage samples requiring special handling (e.g. ,heat- or light-sensitive, radioactive) or have other unusual physical characteristics so they are properly stored and maintained before analysis.

For the Parcel E-2 groundwater investigation, filtering of groundwater samples selected for dissolved metals analysis will be required and will be performed by the laboratory prior to sample preparation and analysis.

Samples will be retained for 30 days after the analytical data report has been written and mailed, unless a request to archive a sample has been made, or previous arrangements have been made to archive the sample. The sample custodian will dispose of samples in accordance with APPL's *Sample disposal and waste collection, storage and disposal,* SOP SHR012, Rev 11, 07/24/07.

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SAP Worksheet #28 -- Laboratory QC Samples Table

SAP Worksheet #28a -- Laboratory QC Samples Table – PCBs

Matrix	Water
Analytical Group	PCBs
Analytical Method / SOP Reference	U.S. EPA Method 8082/ANA8082

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparation/analytical batch	No target compounds ≥ PQL	Assign "B" flag to detections in samples associated with the MB	Laboratory QAM	Accuracy/Bias	No target compounds ≥ PQL
LCS	One per preparation/analytical batch	50-150 percent recovery (%R)	Re-extract or re-analyze samples associated with the MB	Laboratory QAM	Accuracy	50-150 %R
MS/MSD	One per preparation/analytical batch	50-150 %R; ±50 relative percent difference (RPD)	Re-extract or re-analyze samples associated with the MB	Laboratory QAM	Accuracy / Precision	50-150 %R; ±50 RPD
Surrogates	As specified by the method	30-150 %R	Associated samples will be qualified, if appropriate, during validation	Data Validator / Project Chemist	Accuracy/Bias	30-150 %R

SAP Worksheet #28b -- Laboratory QC Samples Table – TPH purgeables

Matrix	Water
Analytical Group	TPH-purgeables
Analytical Method / SOP Reference	U.S. EPA Method 8015B/ANA8015G

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparation/analytical batch	No target compounds ≥ PQL	Assign "B" flag to detections in samples associated with the MB	Laboratory QAM	Accuracy/Bias	No target compounds ≥ PQL
LCS	One per preparation/analytical batch	50-150 %R	Re-extract or re-analyze samples associated with the MB	Laboratory QAM	Accuracy	50-150 %R
MS/MSD	One per preparation/analytical batch	50-150 %R; ±30 RPD	Re-extract or re-analyze samples associated with the MB	Laboratory QAM	Accuracy / Precision	50-150 %R; ±30 RPD
Trip Blank	One per cooler of VOC samples	No target compounds ≥ PQL	Associated samples will be qualified, if appropriate, during validation	Data Validator / Project Chemist	Accuracy/Bias	No target compounds ≥ PQL
Surrogates	As specified by the method	60-140 %R	Associated samples will be qualified, if appropriate, during validation	Data Validator / Project Chemist	Accuracy/Bias	60-140 %R

SAP Worksheet #28c -- Laboratory QC Samples Table – TPH extractables

Matrix	Water
Analytical Group	TPH-extractables
Analytical Method / SOP Reference	U.S. EPA Method 8015B/ANA8015BD

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparation/analytical batch	No target compounds ≥ PQL	Assign "B" flag to detections in samples associated with the MB	Laboratory QAM	Accuracy/Bias	No target compounds ≥ PQL
LCS	One per preparation/analytical batch	70-130 %R	Re-extract or re-analyze samples associated with the MB	Laboratory QAM	Accuracy	70-130 %R
MS/MSD	One per preparation/analytical batch	70-130% R; ±30 RPD	Re-extract or re-analyze samples associated with the MB	Laboratory QAM	Accuracy / Precision	70-130% R; ±30 RPD
Surrogates	As specified by the method	75-125 %R	Associated samples will be qualified, if appropriate, during validation	Data Validator / Project Chemist	Accuracy/Bias	75-125 %R

SAP Worksheet #28d -- Laboratory QC Samples Table – Metals (including Hg)

Matrix	Water
Analytical Group	Metals (Dissolved)
Analytical Method / SOP Reference	U.S. EPA Method 6010BANA6010BPE U.S. EPA Method 7470A/ANA7470A

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparation/analytical batch	No target compounds ≥ PQL	Re-extract or re-analyze samples associated with the MB unless sample is non-detect or is 10 times the blank detection	Laboratory QAM	Accuracy/Bias	No target compounds ≥ PQL
Instrument Blank	As specified by the method	No target compounds ≥ PQL	Re-extract or re-analyze samples associated with the MB unless sample is non-detect or is 10 times the blank detection	Laboratory QAM	Accuracy/Bias	No target compounds ≥ PQL
LCS	One per preparation/analytical batch	75-125 %R	Re-extract or re-analyze samples associated with the MB	Laboratory QAM	Accuracy	75-125 %R
MS/MD	One per preparation/analytical batch	75-125 %R; ±20 RPD	Re-extract or re-analyze samples associated with the MB	Laboratory QAM	Accuracy / Precision	75-125 %R; ±20 RPD
Laboratory Duplicates	One per 10 samples	±20 RPD	Associated samples will be qualified, if appropriate, during validation	Data Validator / Project Chemist	Precision	±20 RPD

SAP Worksheet #28e -- Laboratory QC Samples Table – Ammonia, as Nitrogen

Matrix	Water
Analytical Group	Ammonia, as nitrogen
Analytical Method / SOP Reference	U.S. EPA 350.1/ANA350.1

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparation/analytical batch	No target compounds ≥ PQL	Assign "B" flag to detections in samples associated with the MB	Laboratory QAM	Accuracy/Bias	No target compounds ≥ PQL
LCS	One per preparation/analytical batch	75-125 %R	Re-extract or re-analyze samples associated with the MB	Laboratory QAM	Accuracy	75-125 %R
MS/MD	One per preparation/analytical batch	75-125 %R; ±20 RPD	Re-extract or re-analyze samples associated with the MB	Laboratory QAM	Accuracy / Precision	75-125 %R; ±20 RPD
Laboratory Duplicates	One per 10 samples	±20 RPD	Associated samples will be qualified, if appropriate, during validation	Data Validator / Project Chemist	Precision	±20 RPD

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SAP Worksheet #29 -- Project Documents and Records Table

Document	Where Maintained
Field notes/logbook	Project file
Chain-of-custody	Project file
Laboratory raw data	Project file
Corrective action	Project file and laboratory
Laboratory equipment	Laboratory
Sample preparation	Laboratory
Run logs	Laboratory
Sample disposal	Laboratory
Hard copy of analytical data	Project file, NAVFAC Southwest administrative record
Validated data	Project file, NAVFAC Southwest administrative record

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SAP Worksheet #30 -- Analytical Services Table

Matrix	Analytical Group	Sample Locations / ID Number1	Analytical Method	Data Package Turnaround Time	Laboratory / Organization (include address, contact name, phone number)	Backup Laboratory / Organization (include address, contact name, phone number)
Water	PCBs	All temporary well locations except in metal slag area. All piezometer locations.	U.S. EPA 8082	Two weeks	APPL, Inc. 4203 W. Swift Avenue Fresno, CA 93722 Diane Anderson 559-275-2175	Not applicable
Water	TPH –purgeables / extractables	All temporary well locations except in metal slag area. All piezometer locations.	U.S. EPA 8015B	Two weeks	APPL, Inc. 4203 W. Swift Avenue Fresno, CA 93722 Diane Anderson 559-275-2175	Not applicable
Water	Dissolved metals	All temporary well locations. All piezometer locations.	U.S. EPA 6010B/U.S. EPA 7470A	Two weeks	APPL, Inc. 4203 W. Swift Avenue Fresno, CA 93722 Diane Anderson 559-275-2175	Not applicable
Water	Ammonia, as nitrogen	All temporary well locations except in PCB Hot Spot area and metal slag area. All piezometer locations.	EPA 350.1	Two weeks	APPL, Inc. 4203 W. Swift Avenue Fresno, CA 93722 Diane Anderson 559-275-2175	Not applicable

(1) Sample IDs will be assigned in the field based on the following convention: XXYYA### where XX = last two digits of year sampled (e.g. 07 for 2007), YY = week number (01 to 52), A = first initial of sampler's first name, ### = chronological number of sample taken by that sampler within the week (001, 002, 003…)

(2) Field duplicates will be taken in accordance with the frequency designated in Worksheet #20.

(3) Laboratory will filter sample volume for dissolved metals analysis using a 0.45 micron filter and acidify with HNO3 after filtration.

(4) Laboratory is certified by the California Department of Health Services Environmental Laboratory Accreditation Program (ELAP), National Naval Facilities Engineering Service Center (NFESC), and National Environmental Laboratory Accreditation Program (NELAP) to perform analyses.

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SAP Worksheet #31 -- Planned Project Assessments Table

Assessment Type	**Frequency**	**Internal or External**	**Organization Performing Assessment**	**Person(s) Responsible for Performing Assessment** (title and organizational affiliation)	**Person(s) Responsible for Responding to Assessment Findings** (title and organizational affiliation)	**Person(s) Responsible for Identifying and Implementing Corrective Actions (CA)** (title and organizational affiliation)	**Person(s) Responsible for Monitoring Effectiveness of CA** (title and organizational affiliation)
Technical Systems Audit (TSA) soil boring / temporary well installation	Once at the start of temporary well installation activities	Internal	CE2-Kleinfelder JV	Gary Goodemote Project QAO CE2-Kleinfleder JV (or designee)	Tom Sayre Field Manager CE2-Kleinfelder JV	Tom Sayre Field Manager CE2-Kleinfelder JV	Gary Goodemote Project QAO CE2-Kleinfleder JV
Technical Systems Audit (TSA) grab groundwater sampling	Once at the start of grab groundwater sampling	Internal	CE2-Kleinfelder JV	Gary Goodemote Project QAO CE2-Kleinfleder JV (or designee)	Tom Sayre Field Manager CE2-Kleinfelder JV	Tom Sayre Field Manager CE2-Kleinfelder JV	Gary Goodemote Project QAO CE2-Kleinfleder JV

Note: Use attached Technical Systems Audit Form (attached)

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CE² KLEINFELDER

Technical Systems Audit Form: Soil boring/temporary well installation and grab groundwater sampling

Crew members: _____ Date: _____

_____ Time: _____

_____

Drilling/sampling location: _____

Work activity: _____

	In compliance? Yes	In compliance? No	If "No" Corrective action taken (Attach additional documentation if necessary)
HEALTH & SAFETY			
APP/SSHP readiliy available			
Hard hats			
Steel-toed boots			
Safety vest			
Gloves			
Eye protection			
Air monitoring conducted in breathing zone			
DOCUMENTATION			
SAP onsite			
Boring and well log			
Field notebook			
Sample labels			
Chain of custody			
SOIL BORING/TEMPORARY WELL INSTALLATION			
Drill rods clean			
Boring location			
Boring/well installation form			
Total boring depth			
Soil classified to USCS			
Well materials			
Well construction			
Soil core stored appropriately			
GRAB GROUNDWATER SAMPLING			
Water level probe cleaned			
Total well depth measured			
Depth to water measured			
Adequate water in well to begin sampling			
Sample tubing installed to correct depth			
Sampling flow rate < 500 mL/minute			
Samples collected in correct order by analysis			
TPH-purgeable samples (in VOAs) free of bubbles			
Samples collected in correct containers			
QC samples collected			
Sample storage (cooler, ice, etc.)			
If well runs dry, documented and sampled later			
Well head closed			
Water level probel cleaned			
IDW stored and labeled appropriately			

ADDITIONAL NOTES/COMMENTS:

_____

_____

_____

QA/QC Reviewer: _____ Signature: _____

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SAP Worksheet #32 -- Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (name, title, organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (name, title, organization)	Timeframe for Response
Temporary Well Installation Technical Systems Audit	Audit Form showing results of field audit. If corrective actions are necessary and cannot be implemented during the audit, these deficiencies will be noted and their resolution will be documented in the Corrective Action Response documentation. See attached audit form checklist.	Tom Sayre, Field Manager, CE2-Kleinfelder JV	As soon as possible within same day of finding.	Completed Audit Form indicating all corrective actions taken. Additional documentation will be attached as necessary. From is issued by the Project QAO.	Tom Sayre, Field Manager, CE2-Kleinfelder JV	Upon completion of audit form including corrective action resolution.
		Robert Ferry, Project Manager, CE2-Kleinfelder JV	1 business day		Robert Ferry, Project Manager, CE2-Kleinfelder JV	Upon completion of audit form including corrective action resolution.
		Mohammad Abri, Corporate QAM, CE2-Kleinfelder JV	1 business day		Mohammad Abri, Corporate QAM, CE2-Kleinfelder JV	Upon completion of audit form including corrective action resolution.
		Mark Walden, RPM, Navy	1 business day if corrective action involving >1 day delay is necessary		Mark Walden, RPM, Navy	Included with submittal of Draft Technical Memorandum.

Grab Groundwater Sampling Technical Systems Audit	Audit Form showing results of field audit. If corrective actions are necessary and cannot be implemented during the audit, these deficiencies will be noted and their resolution will be documented in the Corrective Action Response documentation. See attached audit form checklist.	Tom Sayre, Field Manager, CE2-Kleinfelder JV	As soon as possible within same day of finding.	Completed Audit Form indicating all corrective actions taken. Additional documentation will be attached as necessary. From is issued by the Project QAO.	Tom Sayre, Field Manager, CE2-Kleinfelder JV	Upon completion of audit form including corrective action resolution.
		Robert Ferry, Project Manager, CE2-Kleinfelder JV	1 business day		Robert Ferry, Project Manager, CE2-Kleinfelder JV	Upon completion of audit form including corrective action resolution.
		Mohammad Abri, Corporate QAM, CE2-Kleinfelder JV	1 business day		Mohammad Abri, Corporate QAM, CE2-Kleinfelder JV	Upon completion of audit form including corrective action resolution.
		Mark Walden, RPM, Navy	1 business day if corrective action involving >1 day delay is necessary		Mark Walden, RPM, Navy	Included with submittal of Draft Technical Memorandum.

SAP Worksheet #33 -- QA Management Reports Table

Type of Report	**Frequency** (daily, weekly monthly, quarterly, annually, etc.)	**Projected Delivery Date(s)**	**Person(s) Responsible for Report Preparation** (title and organizational affiliation)	**Report Recipient(s)** (title and organizational affiliation)
Temporary Well Installation Technical Systems Audit Report • Audit procedures narrative • Completed audit form with findings • Corrective action response memo	Once	Included in Technical Memorandum (see Project Schedule in WS#16)	Corporate QAM, CE2-Kleinfelder JV Project QAO, CE2-Kleinfelder JV	Navy RPM
Grab Groundwater Sampling Technical Systems Audit Report • Audit procedures narrative • Completed audit form with findings • Corrective action response memo	Once	Included in Technical Memorandum (see Project Schedule in WS#16)	Corporate QAM, CE2-Kleinfelder JV Project QAO, CE2-Kleinfelder JV	Navy RPM
Quality Control Summary Report • Overview of sampling, decontamination, and data storage procedures • Identifies quality control samples and summarizes associated analytical results • Summarizes the findings of the data validation process • Provides an evaluation of data quality in accordance with the data quality indicators defined in the SAP	Once	Included in Technical Memorandum (see Project Schedule in WS#16)	Corporate QAM, CE2-Kleinfelder JV Project QAO, CE2-Kleinfelder JV Project Chemist, CE2-Kleinfelder JV	Navy RPM

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SAP Worksheet #34 -- Verification (Step I) Process Table

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Chain-of-custody forms	COC forms will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the COC form will be initialed by the reviewer, a copy of the COC form will be retained in the project file, and the original and remaining copies will be taped inside the cooler for shipment.	I	Field Manager, CE2-Kleinfelder JV
Field notes/logbook	Field notes will be reviewed internally and placed in the project file. A copy of the field notes will be attached to the final report.	I	Field Manager, CE2-Kleinfelder JV
Technical System Audit (TSA) reports	TSAs for temporary well installation and grab groundwater sampling will be reviewed to ensure that audit forms and corrective action (if any) documentation are complete.	I	Corporate QAM, CE2-Kleinfielder JV
Laboratory data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received data packages will be verified externally according to the SAP-specified data validation procedures.	I, E	Project Chemist, laboratories, and data validators

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SAP Worksheet #35 -- Validation (Steps IIa and IIb) Process Table

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
Planning Documents			
IIa	Methods (sampling and analysis)	Establish that required sampling and analytical methods were implemented and that any deviations were noted. Evaluate whether proper procedures met performance criteria	Corporate QAM, CE2-Kleinfleder JV Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Performance requirements (including QC criteria) for all inputs	Evaluate whether proper procedures met performance criteria and that any deviations were noted.	Corporate QAM, CE2-Kleinfleder JV
IIa	Reporting forms	Establish that required information on sampling and analysis has been provided.	Project Manager CE2-Kleinfleder JV
IIa	Sampling SOPs, plans, location, maps and sample ID numbers	Evaluate whether sampling plan was executed as specified, and sampling procedures were followed with respect to equipment and proper sampling support (i.e., techniques, equipment, decontamination, volume, preservation, temperature, etc).	Geologist Technical Lead, CE2-Kleinfleder JV Corporate QAM, CE2-Kleinfleder JV Project Chemist, CE2-Kleinfleder JV
IIa	List of project-specific analytes	Establish that the project-specific analytes were reported as specified in governing documents (i.e., analytical method, contract, etc).	Project Chemist, CE2-Kleinfleder JV
Analytical Data Packages			
IIa	Case narrative	Establish that the proper communication procedures were implemented by laboratory personnel.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa	Internal laboratory chain of custody	Establish that proper and complete traceability of data from sample collection to data reporting has been recorded on the COC form.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa	Sample condition upon receipt, and storage records	Establish that the proper documentation procedures were implemented by laboratory sample custodian upon receipt of samples and subsequent storage/disposal.	Laboratory Data Consultant Project Chemist, CE2-Kleinfleder JV
IIa	Sample chronology (time of receipt, extraction, and analysis)	Establish that the holding times were met as specified in the method, contract or procedure, and deviations were documented and appropriate notifications were made with approval to proceed.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIa	Identification of QC samples (sampling or lab, temporal, and spatial)	Establish that the frequency of the field and laboratory QC samples was performed in accordance with the method, contract, or procedure.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Associated (batch or periodic) PT sample results	Evaluate the PT sample results against performance requirements as specified by the method, contract, or procedure.	If applicable - Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa	Communication logs	Establish that the proper communication procedures were implemented by field and laboratory personnel.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa	Copies of laboratory notebook, records, prep sheets	Establish that the proper documentation was implemented by laboratory personnel.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa	Corrective action reports	Establish that the proper reporting procedures were implemented from laboratory personnel to laboratory QAM.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Definitions of laboratory qualifiers	Assess that the laboratory data qualifiers were defined and properly assigned per the method, contract, or procedure.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Documentation of corrective action results	Establish that the corrective action procedures were implemented and the corrective action properly addressed by laboratory QAM.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Documentation of individual QC results (e.g., spike, duplicate, LCS)	Establish that the QC results were properly reported, and whether project performance criteria were met.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Documentation of laboratory method deviations	Evaluate whether deviations from laboratory methods impacted data, and if laboratory data qualifiers were assigned, if applicable.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Electronic data deliverables	Assess whether required data/values have been provided by the laboratory in the proper electronic data deliverable format.	Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Instrument calibration reports	Establish that instrument initial and continuing calibration had been performed per the method, contract, or procedure, and any deviations were documented.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa	Laboratory name	Establish that analytical laboratories performing analysis are identified in analytical data reports.	Project Chemist, CE2-Kleinfleder JV

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIa	Laboratory sample identification numbers	Establish that unique laboratory sample identification numbers are used, and are traceable to each unique sample, including QC samples.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa & IIb	QC sample raw data	Establish that QC samples (blanks, MS/MSD, LCS/LCSD, surrogates, internal standards) were analyzed in accordance with the method, and met the performance criteria.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa & IIb	QC summary report	Evaluate whether QC results met project performance criteria, and any deviations documented, and assess blank contamination in accordance with the "5x/10x rule".	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Raw data	Establish that sample preparation and analytical raw data (i.e., calculations, deviations, etc) are correct and complete.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Reporting forms, completed with actual results	Assess whether accurate and complete transcription of analytical data (i.e., analytical instrument output to reporting form), and that quantitation limits were achieved.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa	Signatures for laboratory sign-off (e.g. laboratory QAM)	Establish that each analytical data report was reviewed and signed by the laboratory QAM.	Laboratory Data Consultants Project Chemist, CE2-Kleinfleder JV
IIa	Standards traceability records	Establish that standards and reagents used during sample preparation and analysis are traceable and meet method, contract, and procedural requirements.	Program QAM, CE2-Kleinfleder JV Project Chemist, CE2-Kleinfleder JV
Sampling Documents			
IIa	Chain of custody	Establish that the proper sample custody procedures were implemented by field personnel.	Field Manager, CE2-Kleinfleder JV
IIa	Communication logs	Establish that the proper communication procedures were implemented by field and laboratory personnel.	Program QAM, CE2-Kleinfleder JV
IIa & IIb	Corrective action reports	Establish that the proper reporting procedures were implemented from field personnel to Program QAM.	Program QAM, CE2-Kleinfleder JV
IIa & IIb	Documentation of corrective action results	Establish that the proper reporting procedures were implemented by Program QAM.	Program QAM, CE2-Kleinfleder JV
IIa & IIb	Documentation of deviation from methods	Evaluate whether deviations from sampling and field methods impacted data.	Program QAM, CE2-Kleinfleder JV

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIa & IIb	Documentation of internal QA review	Establish that field and sampling procedures were implemented in accordance with the method, contract, or procedure, and deviations were documented.	Project QAO, CE2-Kleinfleder JV
IIa	Electronic data deliverables	Assess whether required field data/values have been provided in the proper electronic data deliverable format.	Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Identification of QC samples	Establish that QC samples were collected in accordance with the method, contract, or procedure.	Project Chemist, CE2-Kleinfleder JV
IIa & IIb	Sampling instrument decontamination records	Establish that proper decontamination procedures were implemented by field sampling personnel.	Field Manager, CE2-Kleinfleder JV
IIa	Sampling instrument calibration logs	Establish that field instrumentation requiring calibration, was implemented in accordance with the method, manufacturer's manual, or procedure.	Field Manager, CE2-Kleinfleder JV
IIa & IIb	Sampling location and plan	Establish that required sampling locations and sample collection was performed in accordance with the sampling plan.	Hydrogeologist Technical Lead, CE2-Kleinfleder JV
IIa & IIb	Sampling notes	Evaluate whether sampling information was recorded correctly and completely on sampling forms, and any deviations were documented.	Field Manager, CE2-Kleinfleder JV
IIa & IIb	Sampling report (from field team leader to project manager describing sampling activities)	Evaluate whether deviations occurred and potential impact to data.	Field Manager, CE2-Kleinfleder JV
External Reports			
IIa & IIb	External audit report	Review laboratory audit reports, accreditation and certification records for the laboratory's performance on specific methods.	Program QAM, CE2-Kleinfleder JV Program Chemist, CE2-Kleinfleder JV
IIa	External PT sample results	Evaluate the PT sample results against performance requirements as specified by the method, contract, or procedure.	Program QAM, CE2-Kleinfleder JV Program Chemist, CE2-Kleinfleder JV
IIa	Laboratory assessment	Establish that the laboratory is in compliance with the current QA Manual, accreditation and certification requirements, and regulatory requirements.	Program QAM, CE2-Kleinfleder JV Program Chemist, CE2-Kleinfleder JV

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIa	Laboratory QA plan	Establish that the laboratory has a current QA Manual, and has been prepared in accordance with regulatory requirements.	Program Chemist, CE2-Kleinfleder JV
IIa & IIb	Method Detection Limit (MDL) study information	Establish that the laboratory has performed MDL studies on each instrument annually or in accordance with the method, contract, or procedure.	Program Chemist, CE2-Kleinfleder JV
IIa	National Environmental Laboratory Accreditation Program (NELAP) accreditation	Establish that the laboratory has a current NELAP accreditation for the analyses to be performed.	Program Chemist, CE2-Kleinfleder JV

Note: In accordance with NAVFACSW Environmental Work Instruction No. 1: Chemical Data Validation" for sites listed on the U.S. EPA's National Priorities List, 20 % of the data are subjected to a Level IV validation and the remaining 80% of the data are validated as per Level III procedures. The 20% portion of the data set should be comprised of routine field samples and field QC samples such as field duplicates, field blanks, trip blanks, and equipment rinsate blanks.

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SAP Worksheet #36 –Analytical Data Validation (Steps IIa and IIb) Summary Table

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Groundwater	PCBs	CLP National Functional Guidelines-Organics (1999) PCBs and Congeners by EPA Method 8082, Rev 12, 3/08/07	LDC
IIa	Groundwater	Dissolved metals	CLP National Functional Guidelines- Inorganics (2004) ICP by EPA Method 6010B – Three Point Curve, Rev 8, 3/8/07	LDC
IIa	Groundwater	Dissolved metals (mercury)	CLP National Functional Guidelines-Inorganics (2004) Analysis of Hg by EPA Method 7470A, Rev 15, 9/05/05	LDC
IIa	Groundwater	TPH - purgeables	CLP National Functional Guidelines-Organics (1999) TPH by EPA Method 8015B, Rev 7, 7/24/07	LDC
IIa	Groundwater	TPH - extractables	CLP National Functional Guidelines-Organics (1999) Total Extractable Petroleum Hydrocarbons –Diesel, Rev 14, 3/8/07	LDC
IIa	Groundwater	Ammonia, as nitrogen	CLP National Functional Guidelines Inorganics (2004) Ammonia, EPA Method 350.1, Rev 6, 7/23/07	LDC

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SAP Worksheet #37 -- Usability Assessment

The intent of the data quality assessment process is to establish the levels of precision, accuracy, reproducibility, completeness, comparability, sensitivity, and usability of the final results with respect to the project DQOs. Upon completion of data validation, each data point will be assessed as non-qualified, qualified, or rejected based upon the acceptance criteria, and data validation flags will be added to the project data. These parameters will be based upon the analytical data quality, and will encompass the QC criteria established in this SAP. Qualification will be given according to each samples' sample delivery group (SDG), and will be based on the guidelines as presented in the *National Functional Guidelines for Data Review – Organics and Inorganics* (U.S. EPA, 1999 and 2004; respectively). Both analytical completeness and contract compliance completeness levels will then be determined for each analytical parameter. Finally, the overall usefulness of the data will be established as related to the project DQOs.

The usability assessment process is used to evaluate and document the usability of the data by considering the project DQOs (e.g., PARCCS), and whether the data is suitable during the decision-making process. All data types (e.g., sampling, field screening data, and laboratory analytical data) are relevant to the usability assessment. Data usability will include the entry of data validation flags, applied by the third-party validation subcontractor, to the project data.

The assessment should consider each type of data, the relationship to the entire data set, and the adequacy of the data to fulfill the project DQOs. The sample delivery groups (SDGs) are assessed for completeness and compliance to method-specific or project-specific QA/QC requirements, including the results of the independent data validation process. Data validation compares the data quality goals to the actual level of data quality obtained through evaluation of the PARCCS criteria and other method performance requirements. The assessment process also evaluates data quality indicators in terms of the PARCCS criteria and determines data usability for the intended and future purpose(s).

Data Quality Indicators/PARCCS

Precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS) criteria are the qualitative and quantitative indicators of data quality. The PARCCS criteria are defined and discussed below. Quantifiable criteria, known as measurement performance criteria, are presented in Worksheet #12.

Precision

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is measured by collecting data using field and laboratory duplicates and duplicate matrix spike (MS) samples. It is commonly expressed in terms of the relative percent difference (RPD) as follows:

$$RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2} \times 100$$

where:

C_1 = concentration of sample or MS, and
C_2 = concentration of duplicate or matrix spike duplicate (MSD).

Accuracy

Accuracy is the degree of agreement of an observed measurement (or an average of the same measurement type) with an accepted reference or true value. Accuracy of analytical determinations will be measured using laboratory QC analyses such as laboratory control samples (LCSs), MSs, and surrogate spikes. Accuracy is typically measured by evaluating the actual result against the known concentration added to a spiked sample and is expressed as percent recovery (%R) as shown below:

$$\%R = \frac{S - U}{C_{sa}} \times 100$$

where:

S = Measured concentration of spiked aliquot,
U = Measured concentration of unspiked aliquot, and
C_{sa} = Concentration of spike added.

Representativeness

Representativeness is the reliability with which a measurement or measurement system reflects the true conditions under investigation. Representativeness is influenced by the number and location of the sampling points, sampling timing and frequency of monitoring efforts, and the field and laboratory procedures. The representativeness of data is typically maintained by the use of established field and laboratory procedures and their consistent application.

Comparability

Comparability expresses the confidence with which one data set can be compared to another based on using U.S. EPA-defined procedures, where available. If EPA procedures are not available, the procedures have been defined or referenced in this SAP.

The comparability of data will be established through well-documented methods and procedures, standard reference materials, QC samples, and performance-evaluation study results as well as by reporting each data type in consistent units.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. Data validation and data quality assessment will determine which data are valid and which data are rejected. Percent completeness is defined as follows:

$$Percent\ Completeness = \frac{V}{T} \times 100$$

where:

V = Number of valid (not rejected) measurements over a given time, and
T = Total number of planned measurements.

For this project, the completeness goal for this project will be 90 percent for validated project data.

Sensitivity

Sensitivity is the measure of a concentration at which an analytical method can positively identify and report analytical results. The sensitivity of an analytical method is commonly referred to as the detection limit.

Detection and Quantitation Limits

The method detection limit (MDL) is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence from background noise for a specific analytical method. The method reporting limit represents the lowest concentration of an analyte that can be quantified within specified limits of precision and accuracy during routine laboratory operating conditions in a sample matrix. Project-required Quantitation Limits (QLs) are contractually specified minimum quantitation limits for specific analytical methods and sample matrices, such as soil or water, and are typically several times the MDL to allow for sample matrices.

Selected analytical methods and associated QLs are typically capable of quantifying contaminants of concern at concentrations below the most stringent screening criteria. The QLs reflect the maximum sensitivity of current, routinely used analytical methods. The QLs for the Parcel E-2 groundwater investigation are presented in more detail in Worksheet #15 (Reference Limits and Evaluation Table).

For this project, samples will be reported as estimated values if the concentrations are less than the PRQLs but greater than the MDLs.

Describe the evaluative procedures used to assess overall measurement error associated with the project:

The usability assessment process will consist of reviewing the data validation reports for both usable analytical data (i.e., no validation qualifications or estimated "J"/"UJ" qualifications) and rejected ("R" qualified) analytical data, as well as evaluating the field and analytical data for discrepancies or deviations. This assessment will evaluate the impact of the discrepancies or deviations on the usability of the data and assess whether all the necessary information has been provided for the use in the decision making process. The assessment will assess whether there were deviations in sampling activities (e.g., incorrect sample location or analysis performed), chain-of-custody documentation, or holding times; compromised samples (i.e., damaged samples) and the need to resample; or changes to SOPs or methods that could potentially impact data quality.

An evaluation of QC sample results will be performed to assess whether unacceptable QC results (e.g., blank contamination) impact data usability.

The data will be evaluated for overall PARCCS for each matrix, analytical group, and concentration level, and data use limitations will be discussed in the quality control reports for data that do not meet the DQOs or data quality indicators.

Identify the personnel responsible for performing the usability assessment:

Patricia Walters: Project Chemist, CE2-Kleinfelder JV

Richard Amano: Laboratory QAM, Laboratory Data Consultants

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented, so that they identify trends, relationships (correlations), and anomalies:

Usability assessment results will be reported under a quality control summary section in the Technical Memorandum.

References

CE2-Kleinfelder, 2007. "Work Plan for Groundwater Investigation at Parcel E-2, Hunters Point Shipyard – San Francisco, California", November (DRAFT)

EPA, 1999. "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA 540-R-99-008, October.

EPA, 2001. "EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5." EPA/240/B-01/003. March.

EPA, 2004. "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", EPA 540-R-04-004, October.

EPA, 2005. "Uniform Federal Policy for Quality Assurance Project Plans," DoD, DOE Intergovernmental Data Quality Task Force, EPA pub. No. number EPA-505-B-04-900A, DoD pub. No, DTIC ADA427785, March

Kleinfelder, 2004. "Draft Investigation-Derived Waste Management Plan, Basewide Groundwater Monitoring Program, HPS, San Francisco, California." April 5.

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Figures

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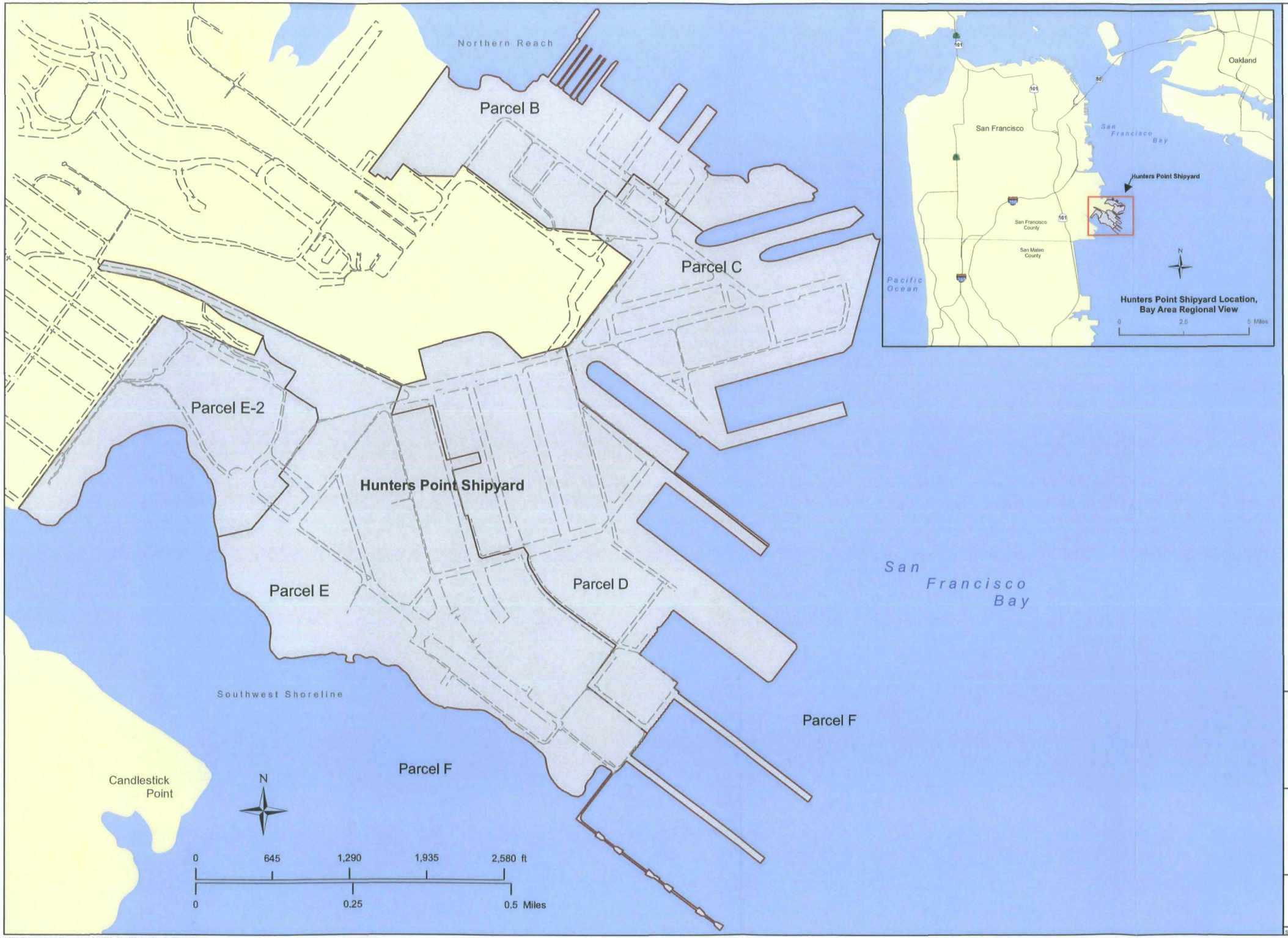

Figure 1.
Site Vicinity and Parcel Locations

Sampling and Analysis Plan for Groundwater Investigation at Parcel E-2.
Hunters Point Shipyard,
San Francisco, California

February 2008

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S. Lovelady CE2Corp: plot 01/09/07

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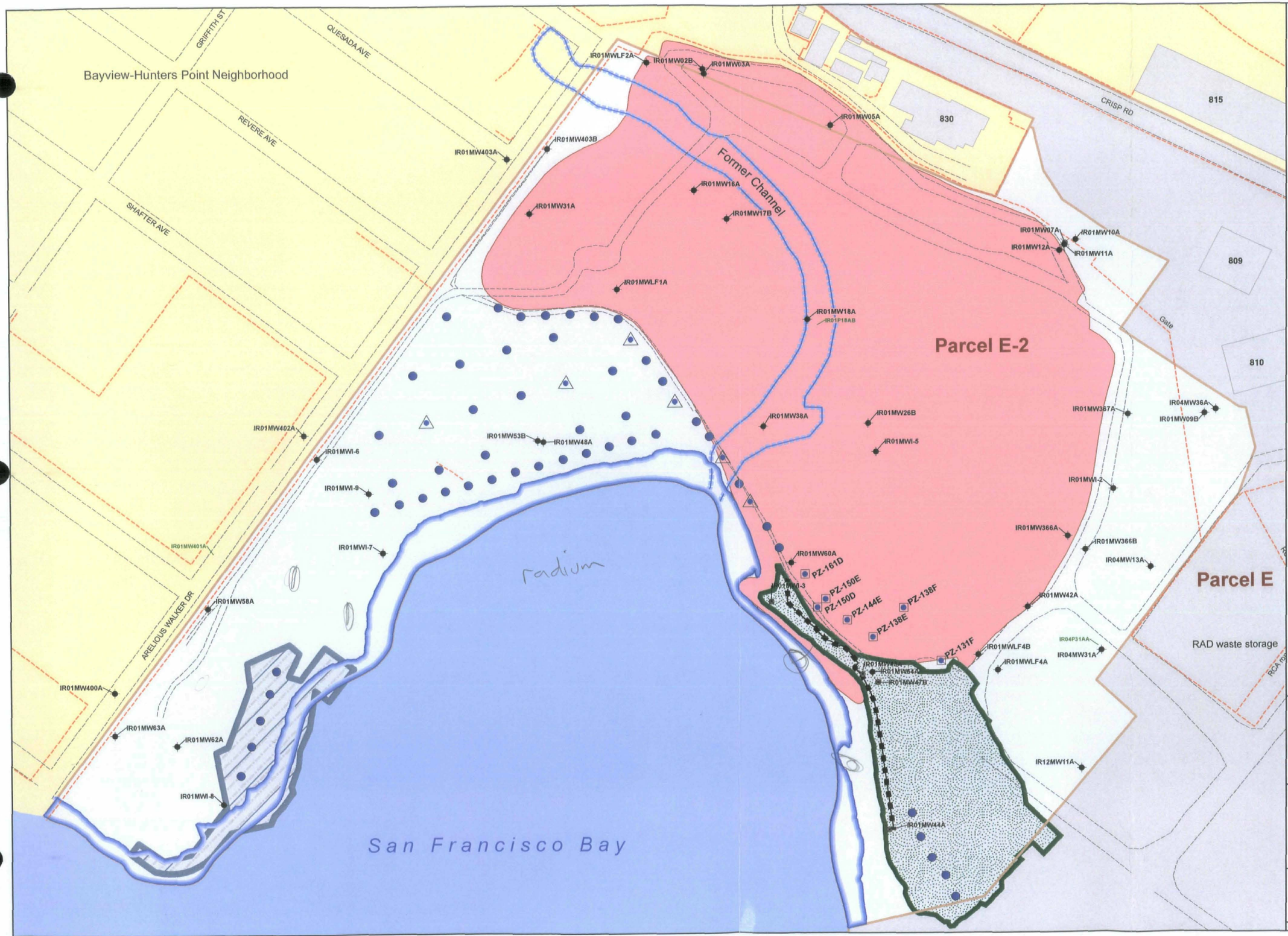

Figure 2.
Proposed Temporary Well and Piezometer Sampling Locations Parcel E-2

Sampling and Analysis Plan for *Groundwater Investigation at Parcel E-2.*
Hunters Point Shipyard,
San Francisco, California
February, 2008

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S. Lovelady CE2 Corporation Plot: 02/13/08

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